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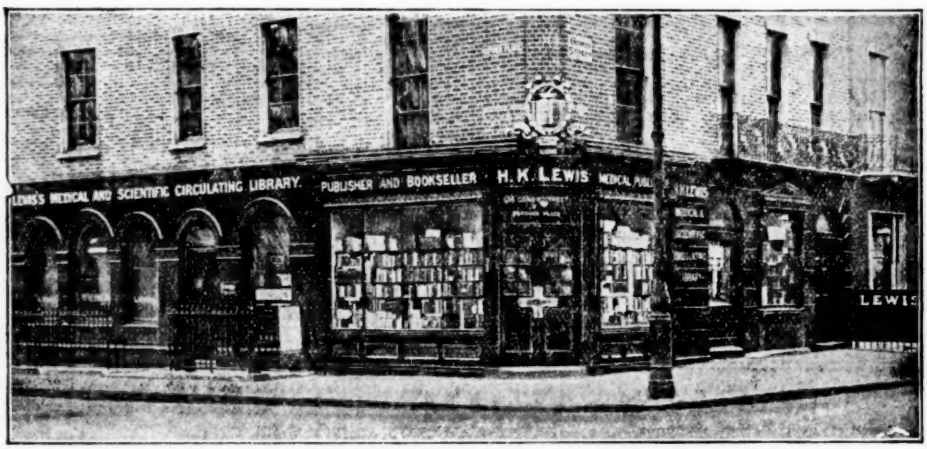

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Delivered at the Royal Society of Medicine on April 23rd, 1919,

BY SIR GEORGE H. SAVAGE, M.D., F.R.C.P.,
CONSULTING PHYSICIAN FOR AND LECTURER ON MENTAL DISEASES, GUY'S HOSPITAL.

GENTLEMEN,—You understand that I am going to give rather a clinical lecture than a general demonstration of all the mental disorders that may be associated with old age.

THE LINES OF DECAY.

You all have heard, over and over again, that you are no older than you feel, that you are no older than your arteries, that your arteries are the gauge of your age. That is all very well, and I do not intend in this lecture to enlarge on those questions. As I have said, I shall endeavour to be clinical. I had a letter from Sir William Osler this morning confirming my original idea that one of the best references on dissolution is by Oliver Wendell Holmes, in which he points out that the "old shay" was so marvellously built that every part of it would last just one hundred years, so that at the end of the hundred years it dissolved and disappeared, and its then proprietor found himself without a carriage at all. One has to recognise that we do not dissolve along those lines, but that devolution with us is in parts, and I shall refer in some detail to the way in which these parts dissolve.

One important thing to remember is the hereditary quality of old age and the hereditary quality of the diseases of old age. You may take a single family and find that one brother after another lives till 75, 80, or 90. I have had more than one example of aged statesmen, every member of the family has lived to about 85 and then broken down mentally. Up to that stage they had stood the stress well enough.

Now as to devolution and evolution. You all recognise the lines of evolution, but the lines of devolution are not the same: the breaking down is not as regular as is the development, and it has struck me as rather important to recognise that what might be called the most essential function or element of mind, the one that begins with childhood and goes on and on—memory—should be one of the first to suffer, not only memory of recent events, but of the more established things too.

LOSS OF MEMORY.

I shall first refer to loss of memory which is morbid. It is quite a common thing for me to have seen people, aged 70 or 80, who have lost all remembrance of their nearest relatives.

An Important Medico-legal Point.

I have seen an old lady of 80 and have said to her, "Well, I have come to see you." "But," she said, "I think you had better see my father first," the father having been dead fifty years. And arising out of this comes a very important medico-legal point. I knew a man who had four sons, three of them having died. He made a will leaving his money to all the sons, though only one was living. These conditions bring up very important considerations in reference to wills.

Here is a very typical example. I was consulted about an old man who was left a widower, with one daughter. He was devoted to this daughter, and thought she was, as indeed she was, devoted to him. But a colonial gentleman came into the neighbourhood, and she fell in love with him and married and went to the colonies with him. The father said, "I have done with you. I want no more of you." Years went by, and she lost her husband—she had no family. She heard that her father was failing in health, and so came back to England to nurse him and look after him. The old affection on the part of the father seemed to have returned; nothing could, apparently, have been sweeter than the re-union of father and prodigal daughter. As time went on, however, he forgot that, and remembered only his daughter as the prodigal, and again he would have nothing to do with her, and he cut her out of his will. There you have the effects of mental denudation.

A Remarkable Case.

And there was another extraordinary case, equally interesting.

When I was at Bethlem Hospital there was admitted a man of about 74. The statement was that he had threatened to murder his wife, a lady of 67 years of age. As was my custom, I went to have a talk with him, quietly and alone, after admission, and in the calmest way possible he said, "Yes; it is true that I said I would injure my wife, but I was justified." I said, "Why?" "Immorality." I said, "Immorality at 68?" He said, "Yes; it is perfectly true, and if you challenge my wife she will admit that she was at fault."

I asked the wife to come up—from Wessex—to see me, and this was her history. Forty or more years previously she had married her husband, though she was in love with a cousin, but this was a much more suitable marriage, and their relatives objected to cousinly unions. Therefore she accepted this husband, and lived with him for some time quite happily. After a few months she went to her own home, merely on a visit, and who should be there but her lover-cousin, who took advantage of her. She felt ashamed of herself, and went back to her husband and made a confession to him. He said to her, "Well, it is very sad, but I do not blame you; the whole incident shall never be mentioned again as long as we live." And so they lived happily, bringing up a family.

When he was between 70 and 80 years of age he suddenly turned against his wife and called her a prostitute, a whore, and such-like names, and threatened her. Under those circumstances he was sent to Bethlem. There, you see, the whole of the 40 years had been lost: the skeleton was disclosed. And, poetically, I said, "Yes, the sands of time have been swept away and laid bare the skeleton; wait a little and the skeleton will be wiped away too." And so it was. Months and years passed, and once more there was peace.

Will Capacity.

Another very important point to remember is that a man's memory may be extremely bad, and yet his Will capacity may be quite good. If you give a certificate as to testamentary capacity, you would generally say a man is sound in mind, memory, and understanding. It is not necessary always that the memory should be good. Take an example.

I had to go down into Suffolk some years ago to see a wealthy old land-owner who was suffering from great loss of memory. The point was this: he had certain property and his sons wanted to sell the property, but the father was of weak memory if not of weak mind. I was introduced to him, and he was very friendly, and asked me if I was going to stay at the hotel during the night; nothing could have been more polite. Then I said, "About your property." Yes, he remembered all about his property. "Are you willing to sell it?" "Yes, except this bit," and he pointed out where it was. He said, "There is a railway coming close to that, and that will improve the value of that property, therefore I will not sell that."

Half an hour afterwards I went back, I was reintroduced, and he said he had never had the pleasure of seeing me before, and we again got on to the property question, and once more, equally clearly, he said, "Yes, I am willing to sell everything except that corner." I saw him after dinner and the same thing occurred. "I have come down from London," I said, "to see you." "Oh, yes, very kind of you; I have never had the pleasure of seeing you before," and again the same thing was gone over. I saw him next morning before I went up to town, and exactly the same thing occurred.

I therefore reported that this man, though so deficient in recent memory, was quite capable of giving instructions for the disposal of his property.

A Strange Case of Temporary Loss of Memory.

Another and, I think, the most startling example of what might be called temporary loss of memory I encountered only last year.

A man from West Australia, a coarse individual who had made an enormous fortune, and was supposed to be the best judge of cattle in the district—at any rate he was a very rich man, and I may say he was also intemperate—I was asked to go into the country to see him in order to witness his will.

His general practitioner was there, a neurological colleague was there, and his lawyer. I said, "Very well, where is your Will?" The Will was brought, and, section by section, I went through that Will with him. I made objections to one or two items in it. He was a man worth about £30,000 a year, and he had suggested that his two children should not be allowed more than £100 a year until they were 21. I said, "That is ridiculous and sweeping." His wife, who was much younger than himself, had this provision: as long as she remained single she should have £15,000 a year, but if she married again, £2000 a year. I said, "That is unjust." He said he did not care. He reasoned and argued, and I thought he was clear on the whole matter. So the Will was signed, and I witnessed it.

Six weeks afterwards I was telegraphed for to come and see him. When I saw him before he was apparently dying from general œdema and dropsy with considerable albuminuria. But I have a favourite axiom, "To the alcoholic all things are possible." At all events, when I went down six weeks afterwards a very dapper little man with a big cigar received me. I said I wanted to see Mr. So and So, and he said, "I am Mr. So and So. You thought I was dying, but I wasn't. I want to talk to you seriously about this will. There are two things very unjust in my will, and yet you witnessed it." "Yes." "About my children. I only allow my boy £100 a year for his education. And the girl, she is coming into a lot of money, yet she should only be educated up to £100 a year. It is wrong. And about my wife, she is many years my junior, and that I should practically knock her income down so considerably is wrong." I said, "Do you remember seeing me before?" "Never." "You don't remember arguing these points with me?" "No, not at all."

Here, then, is a lapse of memory which would have been very complicating in a court of law.

Older Experiences Recalled.

I have spoken of denudation. There is a very extraordinary condition in which the recent things have been forgotten, but older experiences are vividly recalled, as in some hypnotic experiments. I have seen a person hypnotised and heard him recount things which occurred when he was in the cradle or soon afterwards. They might be true.

Take an example. I saw an old officer who had served in the Crimea, and as far as mind and memory generally were concerned they were very defective. But when we began to talk about the Crimea he brightened up and gave me the most wonderful accounts of what happened. Then he entered into detail, and said: "In one of the trenches a funny thing happened, a brother lieutenant had a button shot off his uniform, and no harm done." And he told one or two things of slight detail.

I said to his son and daughter, "Have you ever heard of these things before?" "Never." "Do you think you could find out whether they were true?" They said they would try to find out, and after a good deal of searching they found they were true, and that this accident had happened to a brother officer, yet he had never talked of it before.

You must remember that with loss of memory there may be denudation, which may be very dangerous, as in the case of the prodigal daughter. Loss of memory is supposed to be definitely associated with loss of brain function in some way.

LOSS OF CONTROL.

The next matter I want to refer to is loss of control. Hughlings Jackson, years ago, pointed out that there was layer upon layer of the nervous system, that the last developed was the highest in function, the great controller, and that by the removal of something, power seemed to be increased; that is, control being removed, the next function or part of the brain reacted to stimuli much too vigorously, so that with loss of control there was often exaggerated action. Let us look at the relationship of loss of control.

Restlessness in Old Age.

First of all you will find that one of the most troublesome of the minor symptoms is restlessness in old age, exhibiting itself in various ways, according to the sex. I think that some of the martyrs of society are the only daughters of senile mothers, women who are always "on the go," first of all domestically. The servants do not get up early enough; the fussy old lady is up at 6 A.M., disturbing everybody during the day. She goes to her bedroom and tidies up, or rather begins to tidy up, for, of course, the first process towards tidying up is untidying, and she never gets beyond that stage. The whole restlessness of these old people is striking.

The man, on the other hand, often develops grandiose ideas; in fact, in my younger days—now long ago—I mistook some of these cases for senile general paralysis. Individuals ranging from 60 to 80 years of age came telling me they were never stronger or better in their lives, and, unfortunately, in many cases they wanted to marry. The next thing is, they are going to do this and that. Many a senile man has ruined himself with that restlessness, with that belief in himself which led to his having so many irons in the fire, and finally putting it out.

Another case I remember was that of an English nobleman who, suffering in this way, caused great trouble. His family had a lot of valuable heirlooms, and he was so afraid they would be stolen that he was always hiding them, so that they could not be found. I remember cases of this forgetfulness and restlessness which were an awful nuisance, so that servants have been accused of stealing things which the old people themselves have secreted somewhere and forgotten where they put them.

Such a man will frequently start fresh schemes, and not infrequently he will follow his grandiose ideas out. I do not know whose epigram it was, but someone said what they lose in virility they gain in verbosity. At all events, there is some truth in it with many.

There is another awkward feature which leads to all sorts of other troubles, and that is disturbed sleep, the sleeplessness of old age. If you belong to London clubs you will find that about 5 o'clock about one-third of the members present are asleep, the older ones particularly. And they are the very men who complain that they do not sleep much at night. Mind you, they do not sleep better at night if they do not sleep in the day.

Emotional Weakness.

Then there is another serious complication, due to loss of the highest self-control—the hysterical, emotional condition. Of course, it is the commonest thing, which any of us who are old recognise, that tears are much nearer to the surface than they were; that the novel will now more easily arouse the emotions and the feeling in the throat; that the play which you smiled at before will now cause you emotion. That is only the beginning; it leads also to many sexual complications.

What may be called the less abnormal kind of case is that in which an old man marries a young woman. That, of course, may, or it may not, lead to serious consequences. I have seen some of the most disastrous consequences, such as in cases where a young woman believed she did not require sexual enjoyment and she married an old man, with the result that later she developed abnormal sexual tendencies and feelings, and all kinds of troubles ensued.

Associated with this emotional weakness is another complication that not infrequently leads to Will and testamentary trouble; and that is the way in which the old man particularly is influenced by servants and other dependents. I remember having to go down into the country to see a retired major, a man nearly 80, who had a man-servant who had been with him for years. He had been a most valuable servant, and remained valuable while he was a servant. But when he saw his master getting weakminded he dominated him in—I was going to say—an amusing way; for this valet-companion took to racing, and he used to get the old major to advance the money. The result was that he seriously complicated the affairs of this man. Therefore, on the hysterical side, you must recognise this loss of self-control and the tendency to be influenced by younger women, by servants, and the like.

Evil Actions by Men of Repute.

Then comes the saddest case of all, I think, where men of the very highest reputation do some foolish, dirty, or wicked thing.

Take an example. A professor, who had been looked upon as the most godly of men, on going down into Wiltshire got into a carriage where there was only a telegraph boy, and while in the carriage he attempts to abuse him sexually. Reports from bishops, from heads of colleges, from high

literary and theological authorities say it is impossible for this man to have done this. The result was he was let off. He was sent to an asylum, where he confessed and cut his throat.

I have seen over and over again cases of this sort. There was one man, of great distinction, who, losing his self-control with age, took a woman of ill-fame down to his old college at the university. I protested against his doing such a thing, and he said, "The head of the college does not speak French, and she does not speak English, so no harm is done." He did not see the iniquity of the whole thing.

Distressing Cases.

I think one of the most pathetic cases I remember was that of an old clergyman, who had been a distinguished scholar at his university and who, when he was advanced in years, lost his wife, who had been, literally, his guardian angel. As he got still older he was self-negligent, and instead of being a well-dressed dapper English clergyman he was dirty, he did not shave, and was untidy. He was still conducting services, but he made all sorts of mistakes, and at last the bishop told him he must take a long rest. He took a rest, and came up to town, with no one to look after him, and the poor old man fell into the hands of women of the lowest order, and they pillaged him and got everything they could from him. His reputation was gone. Then, fortunately, he passed into a condition of senile dementia, and died.

There is an accompaniment of this loss of control which is noteworthy. I do not know of any age when self-abuse may not be indulged in. I remember a man at Bethlem Hospital, over 90, who was guilty of the vice. Of course, in the majority of these cases, there has been a period of 30 or 40 years during which there has been nothing of the sort, and its indulgence has only come with the loss of self-control. And one of the most distressing symptoms in elderly ladies is this disregard of what I was going to call decency. There is one lady I have seen recently who, when you go into her room, will, without the slightest provocation, pull up the whole of her dress. These are very distressing cases.

MENTAL DEPRESSION.

Having dealt with defects of memory and of self-control I now want to speak of mental depression, the so-called senile melancholia. I suppose that is the normal thing for a large proportion of men particularly.

Bodily and Mental Troubles

The weight of years shows itself in two very marked directions.

In one of these, the bodily trouble is the chief one, the hypochondriacal senile case, and these are very numerous, and, unfortunately, hard to treat. I shall see, this afternoon, at an asylum, an old man who, in many ways, if they can get him to play a game of billiards or bridge, will forget his troubles for a time, but when these stimuli are absent he is sitting down with his abdomen covered by his hands. He says, "It is no good, there is a stoppage, a blockage." "But," I say, "has nothing passed?" "Nothing for months." "But you are losing weight and yet you take food?" "Yes, but nothing passes." In years gone by I examined the tissues and the sympathetic systems of a number of these cases, but there was nothing at all to point to defect.

The next, and perhaps still more common feeling, is that of loss of ability; in fact, many of these cases of senile melancholia are only what I call morbid mental growths. The individual who has been conscientious becomes over-conscientious; he thinks he has not done right, and he cannot do this and that. And still he prefers to go on struggling. He has lack of ability, lack of power of concentration, the feeling of dependence upon others, and yet the dread of the results of doing so. That, again, is very common.

Then I must mention what I call

The Saturated Solution of Grief.

This saturated solution crystallises out in one form or another.

You may meet with, for instance, a parson who is satisfied he has never fulfilled his religious duties. As one bishop said to me when suffering in this way, "I was never fit to be a bishop"; and I said, "Nobody ever was, so be content." However, in him it showed itself in that way.

Just as the young medical student fears aneurysm and heart disease—at least he did in my day; I don't know what he gets now—so the old doctor gets, or thinks he has, cancer. Supposed aneurysm is another cause of the miserable feelings of the old doctor.

The business man naturally shows his defect in imagining he is ruined or that ruin is impending, and that nothing will prevent that ruin. In him reason and feeling run like two parallel lines, for they never meet: they go on separately for ever.

Let us take an example. A man whom I had to see was a very rich manufacturer, and he had the idea that he was ruined. I said, "It is nonsense." He said, "You know, I am very sorry, but you will not get your fee; there is no money at the bank." I said I would risk that. He said, "It is no good; I am absolutely ruined." I said, "I shall see you again in a fortnight's time, and I will have your bank pass-book and a report from the manager of your works." Armed with these pieces of evidence, I showed them to him. He looked at them very carefully, and then he said, "Yes, but that was the day before yesterday; now I am ruined." Feeling overrides all reason in that way. Over and over again one has tried without avail to reason with people, hoping that by repeating and repeating and repeating they would be convinced.

The Tendency to Suicide.

There is one axiom I would impress on you: every senile melancholic is a suicidal person. Look at the suicide reports in the newspapers and note the number of men between 65 and 85 who commit suicide. They have a feeling of unworthiness. The clergyman rarely does it, or the man who believes himself to be eternally damned. One such said to me, "I'm going to hell anyway, but I do not wish to go prematurely." There is something in that. At any rate, you have to think of the business man and the man who thinks he is sexually impotent. This is the way it sometimes comes about. A man loses self-control and re-develops sexual desire and, to a certain extent, sexual power. Then it goes altogether, and he worries himself because he is now, although old, impotent. In parentheses I may say that bridegrooms who commit suicide just before or just after marriage do so because they think they are impotent.

A Business Example of Tendency to Suicide.

Let us take a good business example. I had to go and see a man in a City office. The son said, "Father will not come to see you; he will not admit there is anything mental about him; he says it is financial; and probably if you went to see him he would say, 'If you will give me a cheque for £10 000 it will be all right, but as for medicine, that is out of the question.' We are not sure about him." I went to see this man. He was a big ship-builder. He received me very politely, but he said, "It is not really a question, doctor, to discuss with you, I am a ruined man." There was some ground for this idea. Just before one of his big ships had failed in the launching; it had stopped on the stocks. They got it off, but that started the impression that he was ruined, and that he would never get another order for a Government ship.

I suggested to the son that he was dangerously suicidal, and that there was only one thing to do, and that was to provide him with a male nurse and take him from the office right away and keep him away without letting him go home. I told them to take him to some quiet country place. They did so, and they found a loaded revolver, and a razor (he did not shave), and poison. The man had made up his mind to take his life, as he was ruined.

As a rule, if the doctor does anything of the kind he takes poison, but the hypochondriacal doctor still has experience and knowledge enough to know that even cancer patients sometimes improve, and they are not so suicidal. I think the most suicidal type of man is the mercantile man who believes he is ruined.

HALLUCINATIONS.

We have discussed loss of memory, loss of control, and exaggerated self-consciousness. Finally, we come to an interesting group—namely, those in which there is a pure sensory disorder, hallucinations.

It has always interested me to notice that with the evolution and dissolution you get similar symptoms of sensory disorders. The youth who is on the road to dementia præcox, who is probably a frantic masturbator,

has hallucinations of smell; he also has visual hallucinations, he sees people in his room. In fact, the state is very nearly allied to a delirious condition.

Hallucinations of Smell.

And one has always felt it is interesting that the organ of smell, though a lower one, is still very highly organised, and it is very closely associated with our whole mental stability and mental growth; it is interesting that it should show disorder in devolution and in adolescence.

I have constantly met men who have complained bitterly about their houses. Take an example. A man told me it is perfectly useless, he cannot get on, and that his wife will not understand that they have a bad cook, and that there are always stinks about the house.

I will tell you of one of the most tragic instances I remember, though there was a comical side to it, too, as there often is. It was the case of an old doctor with a large practice in the neighbourhood of London, who had known me from childhood. His wife asked would I come up and dine with them, so that I could see her husband, who was causing her anxiety. I went. The first thing I noticed about him was that he was very restless. He said, "I am very sorry, you cannot have any dinner." "Why?" "I have discharged the cook." "Why?" "The whole place is stinking of stinking fish. And I cannot send you home." "Why?" "I have discharged the coachman, the stable stinks." It was a trying experience, to some extent. A week later I had a communication from the authorities asking what I thought of Dr. So and So. I asked why. They said, "He is medical officer of health, and he has given orders for the drains to be had up in several of the leading streets." Fortunately, for the sake of the ratepayers and other things, he had an apoplectic seizure and died.

Hallucinations of Sight.

Then I must mention hallucinations of sight, which also are very interesting. I think the best thing I can do, again, is to give one or two examples.

I had to go down to the West of England to see a wealthy old bachelor, who was a big coal owner. He had a kind nephew and a hard nephew. The former said, "Let the old fellow live in his own house under care." The other, the more businesslike of the two, said, "The old fellow is a fool; send him to an asylum." It was decided that I should go and see him, and give my view as to whether he should be treated at home or sent to an asylum. I found in the old man many signs of age. He was a charming personality, and, like so many merchants, a collector of pictures. He took me round and showed me his pictures, and told me where he had got them. Then suddenly he said, "That's a nuisance." I said, "What?" He said, "Don't you see that water running across the floor?" "No, there is no water there." "Do you mean you don't see it?" I said, "Put your finger down." He said, "That is all very well. I put blotting paper down and it does not get wet, but there it is." Looking out into his garden he said, "Well, do you see that old rabbit and her young?" I said, "There is no rabbit there." "Yes there is, running just into that laurel bush." I said, "No. Look here, if I get a gun, will you shoot it?" "No," he said.

The next might have been a very serious case. It was that of a lawyer with a very large city practice, and he had a lot of trust securities. One Christmas day some years ago he thought he would go and have a look at the securities by himself, with no clerks or anybody about the office. In he went and got out securities for many thousands of pounds and was looking at them. He turned round and thought he saw his son and said, "You put these securities away," and he went home. His son, fortunately, went early next morning of business and found these securities, which the old man had left on the table.

You see how difficulties might arise in that way. A man may have hallucinations of that kind and think burglars are about. I knew one who had that impression and fired a revolver. Fortunately, the "burglar" was a ghost, and no harm was done.

These hallucinations are in old people not infrequently most prominent at the waking moments. There was one old lawyer I saw some time ago who recognised that his ideas were wrong, but said they were so dominating that he could not control himself. I said to him, "What are your troubles?" He said, "To begin with, in the morning I wake up and—I cannot help it—I spring out of bed because I see a dirty gipsy using my tooth-brush. Yet I know there is no gipsy there, and I go back to bed again, and reflect on what a fool I was." I said, "Does it occur at any other time?" "Yes, it is always after waking. I come home from the office, I sit down about 6, and have a nap before I dress for dinner, and when I wake up from the nap I see the same gipsy pulling up my favourite flowers."

These hallucinations are most marked. There may be other hallucinations, but usually they are not so marked.

It is interesting that, in these decadent cases, you get a reversion, to a certain extent, to the form of disorder which may occur in youth.

SOME POINTS EMERGING FROM STUDY OF CASES.

There are two or three things to learn from a study of these cases. One is, one's limitations. I often think of a time I was on the moors in Scotland, where there was an elderly Scotch lady. I had failed at something—shooting, golf, or something—and she said, "You are old enough to have learned your limitations." That is one of the things we have all got to learn; and not only our own limitations, but normal limitations. There are lots of people who, though old, are very useful; there are many people whose age need not interfere with their capacities.

Another thing to bear in mind is that a person who has had energy enough to live to 80 has probably a reserve energy which can be called up when required. I used to say, and still say, that as far as mental disorders are concerned I would much sooner consider a patient hopefully who broke down for the first time at 60 years of age than I would one who broke down mentally at 16, because, unless there is some special cause, in the first case we have a person who has lived long without accident, and may therefore be assumed to have some reserve, which may be used towards recovery.

And we must also remember that a lot of the brightest, best, and most intellectual people die "at the top."

BILHARZIASIS: SOME RECENT ADVANCES IN OUR KNOWLEDGE.

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I. *Historical Account of Recent Work.*

Up to the year 1912 the exact conveyance of bilharzia disease from one man to another was still a matter of conjecture. Looss,[1] who had worked for many years on the subject, was of opinion that the life-history of bilharzia differed materially from that of the other trematodes in that the *Miracidia*, or ciliated embryos, emanating from the ova passed directly through the skin, while Manson,[2] arguing on biological analogy, stipulated that an invertebrate intermediary host must exist. Looss[3] also denied the existence of two species of bilharzia worms in Egypt. Manson[4] and Sambon,[4] on the contrary, on geographical and morphological grounds, considered that there were two species of bilharzia, the one giving rise to a lateral-spined egg, and occurring commonly as an intestinal infection, and that the latter worm occurred in parts of the world (West Africa, South America, and the West Indies) where the terminal-spined egg is not found.

As regards *Bilharzia* japonica*, the general morphology of the worm and its pathology were at that time understood and its specificity established. For the earliest work on the transmission of *B. japonica*, and, in fact, bilharzia worms in general, we are indebted to Japanese workers. The earlier efforts of Cobbold[5] in 1870, Sonsino,[6] in 1884, Lortet and Vialleton[7] in 1894, to trace the development of Egyptian bilharzia in molluscs and arthropods, as well as numerous

* In adopting the generic term *Bilharzia* in preference to *Schistosomum* I have followed Leiper's latest dictum, 1918, R.A.M.C. Journal, xxx., No. 3, 235-60. Bilharz discovered the worm in 1851, which he named *Distomum hæmatobium*, but which was renamed *Bilharzia* in honour of its discoverer by Cobbold. In 1858 Weiland had created the genus *Schistosoma* for the worm *Distomum hæmatobium* of Bilharz and von Siebold. One must agree with Leiper that the generic name bilharzia which conformed to the generally accepted views on nomenclature of those days should stand as a perpetuation of the name of its discoverer. The specific name thus becomes feminine, i.e., *B. hæmatobia*.

attempts to transmit the disease directly to man by the agency of miracidia, failed.

In 1908 Fujinama[8] and Nakamura first found domestic animals infected with *B. japonica*, and that if non-infected cattle, dogs, and cats were immersed in streams, popularly reputed to be dangerous, an intense infection resulted. In 1910 they repeated these experiments with animals, such as mice, which are not found naturally infected, and found young parasites in the portal vein three days after immersion. In addition, the infection of man by these means was proved by Matsuura,[9] who placed his legs in infected water and some time after passed ova in his stools. In 1911 Miyagawa[10] repeated these experiments and described the invasion forms.

In 1913 Miyairi and Suzuki[11] indicated that a freshwater mollusc acted as the intermediary host, and early in 1914 Ogata[12] accurately described the bifid-tailed cercariæ (or larva) of the worm. In that year Leiper and Atkinson[13] were on an expedition to Yangtze Valley and Japan to investigate the matter and amplified these observations, and demonstrated the life-history of the parasite in the freshwater mollusc now known as *Katayama nosophora*, a new species; furthermore, they completed the story by infecting mice with the characteristic cercariæ through the skin and later by demonstrating the adult worms of both sexes in the portal system.

Our knowledge of the life-history of *Bilharzia japonica* was thus complete at the outbreak of the world war. Realising that the high endemic index of bilharziasis in the Nile Valley (61 per cent. of fellaheen (Ferguson[14]) with a death-rate of 10 per cent. (Madden[15])) and the consequent danger of infection to a large number of British troops, the War Office decided to dispatch a special mission, consisting of Leiper, J. G. Thomson, and Cockin, to reinvestigate Egyptian bilharziasis.

This mission was a complete success. Within six weeks of commencing work in February, 1915, the non-eyed, bifid-tailed cercariæ (characteristic of the genus) were found in two different genera of snails. During the following year Leiper followed up his observations by completely vindicating the existence of two separate species of bilharzia worms in man. The one now known as *Bilharzia hæmatobia* presented distinctive morphological features, laid a terminal-spined egg, and developed in a sinistral and spiralled freshwater snail (*Bullinus* sp. *contortus* and *dybowski*). The second is now known as *Bilharzia mansoni*. It gives rise to a *lateral-spined* egg and develops in a flat freshwater snail, *Planorbis boissyi*. In addition to this he experimentally infected animals both via the unbroken skin and via the alimentary tract.

II. *Life Cycle of the Bilharzia Worms.*

The ova are voided either in the urine or fæces, or in both. On coming into contact with water (that is, a fluid of lower osmotic pressure) the chitinous envelope of the egg becomes distended and ruptures, thus freeing the active, ciliated miracidium which it contains. This ciliated embryo swims about rapidly in search of the intermediary host for a period of 24–36 hours, to which it is attracted by chemiotactic influence. It then enters the snail by piercing the pulmonary chamber by means of its piercing papilla and makes its way to the digestive gland (or liver), situated in the central whorl.

In this situation the germinal cells of the embryo multiply rapidly and become hollowed out into mother and daughter cysts, which are now known as sporocysts, and which radiate throughout the glandular substance. No redial stage as in other digenetic trematodes exists. Inside the sporocysts cercariæ are produced by a process of internal budding. After a period of from four to six weeks, fully developed, active cercariæ are discharged by rupture of the sporocysts, and make their way through the body cavity of the intermediate host into the water. In this medium they can remain alive for 36 to 48 hours, and in this limited time must meet their definitive host or else perish.

The cercaria† itself consists of: (*a*) a body with two suckers, anterior and ventral, and a number of secretory cells called "poison cells." (*b*) A tail with terminal fork. The bilharzia cercariæ belong to the furcocercous group of the distome trematodes, and are further distinguished by absence of a muscular pharynx and absence of eye-spots.

There are minor features which differentiate the cercariæ of the three species of bilharzia. On the whole those of *B. hæmatobia* are slightly larger (0·472 mm.) than those of *B. mansoni*, while those of *B. japonica* are about half this length. A point by which the cercaria of *B. mansoni* can be distinguished from *B. hæmatobia* is the prominence on lateral view of the ventral sucker in the former (Fairley and Bahr: Report to Australian Government, 1918). Furthermore, in this report it was shown as a result of 10,000 dissections of freshwater snails in Egypt (*Planorbis* and *Bullinus*), that the period of maximum infectivity for both species of parasite occurred, contrary to general expectation, during the winter months (54 per cent. of *P. boissyi* and 11 per cent. of *Bullinus contortus* dissected near Cairo).

Infected snails may be distinguished on macroscopic examination by the great friability of the shell and by the change in colour it undergoes. On placing such a snail in water, after a few minutes, cercariæ can be seen emerging with the naked eye or low-power lens.

On entering the skin of the host these cercariæ cast their tails and bore their way through the tissue by means of papillæ on the oral sucker and possibly assisted by a chemical ferment. Not infrequently in man, as in experimentally infected monkeys, cercarial invasion is accompanied by intense skin irritation. The larvæ reach the portal system via the veins and possibly via the lymphatics as well, and there develop in a period of from five weeks into adults of two sexes.

III. *Morphological Distinctions between Adult Worms.*

I propose to deal with the chief morphological distinctions of the two Egyptian species of bilharzia, as *B. japonica*, having no tuberculated coat and laying a small rounded and lateral knobbed egg, is easily separated.

The following are the main points:—

Males.—The male of *B. mansoni* is generally smaller in size and more grossly tuberculated than *B. hæmatobia*. The testes are smaller, and eight or nine in number, whereas in the latter there are four or five larger ones.

Females.—The female of *B. mansoni* is smaller than that of *B. hæmatobia*, which measures 2 cm. The ovary is situated in the anterior half, in front of the union of the intestinal cæca and the uterus, and contains generally only one lateral-spined egg at a time; occasionally, however, I have seen two or even three lateral-spined ova in the same female worm. In *B. hæmatobia* the ovary bears the same relationship to the intestinal cæca, but is situated in the posterior third of the worm, and the uterus contains large numbers of terminal-spined ova.

IV. *Some Recent Points in the Clinical Appearances of Early Bilharziasis in Man.*

From a clinical point of view bilharziasis, at least as it has manifested itself amongst soldiers, can be divided into two stages: (*a*) the toxæmic stage, occurring four to ten weeks after infection; (*b*) a much later stage of localised disease characterised in the case of *B. hæmatobia* by vesical and in *B. mansoni* by intestinal symptoms.

(*a*) *The Toxæmic Stage.*

The earliest symptoms associated with bilharziasis were first accurately described in *B. japonica* infections. Excellent descriptions of this disease have been given by Edgar[17] (1911), Bassett-Smith[18] (1912), Miyagawa[19] (1913), and Laning[20] (1914). Archibald[21] in 1914 described febrile symptoms in *B. mansoni* without eosinophilia, and suggested it was due to a secondary infection. Previous to this Flu[22] in Surinam called attention to the appearance of febrile symptoms resembling katayama disease in cases with lateral-spined ova in their fæces.

In 1916 Lawton[23] described an outbreak of bilharziasis amongst Australian troops in Egypt. His cases presented some or all of the following symptoms: "Abdominal pain, enlargement and tenderness of the liver and spleen, pyrexia, bronchitis, urticaria, and diarrhœa." Eosinophilia was always present and the fæces contained the lateral-spined ova of *B. mansoni*. The onset was often insidious and the incubation period averaged four to eight weeks. The temperature lasted from ten days to eight weeks. Emaciation was marked.

† One must emphasise that there may exist other furcocercous cercariæ in the snails which act as intermediary hosts for human bilharzia. These have distinct morphological characters and probably represent the larval stage of some bilharzia-like parasite of small mammals or birds. Two of these species have been found by Leiper and Bahr in Egyptian snails.

The analogy between this and *B. japonica* infections —the "katayama disease" of Japan—was thus complete. In a series of 75 cases amongst Australian troops I have abundantly confirmed and amplified Lawton's original observations. That these toxæmic symptoms, however, are not necessarily dependent upon an infection with one species of bilharzia alone is evident from the fact that I have noted identical symptoms in pure *hæmatobia* infections from Serapeum ‡ as well as in double infections. In fact, 34 out of 35 cases of the present series from Tel-el-Kebir belonged to the latter category, that is to say, that terminal- as well as lateral-spined ova were present in the urine and fæces. In addition to this, 10 out of 13 of Lawton's original cases who have since developed vesical symptoms in Australia were found to be similarly affected.

The present series of cases may be classified, according to the presence of outstanding clinical phenomena, as follows: (1) those presenting symptoms of urticaria and prolonged pyrexia; (2) those with urticaria and pyrexia of less than ten days' duration; (3) cases with urticaria alone.

It is unnecessary in the present paper to amplify the clinical details, except to say that the urticaria is of the most intense type, causing a general œdema of face and often of penis and scrotum as well, with the formation of wheals on the trunk and limbs. It is sudden in appearance, remarkably transient, and lasts on and off from one to ten days.

After disappearance of this stage a latent period supervenes, which may last anything from six weeks to two and a half years before obvious symptoms of localised bilharziasis are noted, though ova are being passed in the dejecta during the whole of that period.

(*b*) *Localised Disease:* (1) *Vesical Bilharziasis.*

The localised symptoms can be classified according to the site of the lesion and the species of the parasite.

This description of early vesical bilharziasis is compiled from 45 cases of pure *B. hæmatobia* infection.

The onset is most commonly ushered in by a burning and scalding urethral pain, in others the pain may be deep-seated, perineal, or referred to the penis; this is followed by a terminal hæmaturia, the most characteristic feature of vesical bilharziasis. This hæmaturia may be a constant feature or may be of a most irregular nature. I wish to emphasise that *pain* is not a dominant feature of the disease. When it occurs it may be referred to the perineum, the urethra, the suprapubic region, or to the loins or small of the back. Suprapubic pain is especially marked during distension of the bladder, and the suprapubic region is the most common site of discomfort.

Frequency of micturition is generally met with at some stage of the disease, but is usually an early and transient symptom lasting four or five weeks. Urgency is a common complaint.

In these pure *hæmatobia* infections it is quite common to elicit a history of passage of blood and mucus per rectum, though they do not actually amount to dysenteric attack. On rectal examination localised tenderness above the prostate gland and in the region of the vesiculæ seminales is noted.

Cystoscopic examination shows congestion of the mucosa and frequently the presence of white submucous nodules. The *urine* may show macroscopic evidence of mucus and blood, and a small amount of albumin may be present. The ova can best be demonstrated in the centrifuged deposit of the urinary residuum, and are associated with pus and red cells. A point of considerable importance is that these ova may be passed in a most vagarious manner, and that therefore a single negative examination of the dejecta does not exclude the disease.

Contrary to what is stated in most text-books terminal-spined ova have been found in the fæces of most of these cases.

‡ As a notable confirmation of Lieper's work the following points are remarkable. In the first instance the patients, who were stationed at those posts in 1916, were admitted to hospital with symptoms of bilharziasis; the nature of their infection being determined by the usual methods. Cases from Serapeum showed only *B. hæmatobia*, while cases from Tel-el-Kebir showed double infections. Following on this discovery the snail fauna of both these localities was investigated by Captain Bahr and myself with the result that in the former the presence of bullinus only could be substantiated, while at Tel-el-Kebir infected snails of both species were demonstrated. As a further proof it may be cited that monkeys were infected with bilharziasis, with cercariæ derived from infected snails obtained from these localities. The chain of evidence was thus complete.

The examination of the *blood* shows certain constant changes. There is a moderate *leucocytosis*. In 35 cases the average count was 10,030; the lowest 4700; the highest 22,000. The differential count in these cases demonstrates an average eosinophilia of 13·5 per cent., with a relative decrease in the polymorphs. The tendency is for eosinophilia to be most marked in the toxæmic stage (Lawton 50 per cent.), and gradually to decrease during the subsequent two years to an average of 11 per cent. The red cells and hæmoglobin show nothing of interest, except a slight secondary anæmia.

The ravages of late urinary bilharziasis, resulting from the repeated infections, to which the Egyptian fellaheen are constantly exposed, have not been observed in European troops during the war. In the Egyptian such complications as septic cystitis, hydro- and pyonephrosis, interstitial nephritis, urinary calculi, vesical carcinoma, urethral and perineal fistulæ are commonly observed. The comparatively high death-rate (10 per cent.) amongst these unfortunate people is occasioned by three factors: mechanical obstruction by bilharzial granulation tissue, secondary septic infection, and malignant supervention.

As Day [24] first pointed out in these late cases the blood picture differs in certain respects. There is a relative and absolute increase in the polymorph neutrophiles, with a corresponding decrease in the eosinophile elements and the establishment of a severe secondary anæmia.

(2) *Intestinal Bilharziasis.*

This description of early intestinal bilharziasis is compiled from a study of 38 cases of *B. mansoni* infection. Most of these were complicated by concomitant *B. hæmatobia* infections. In the latter the vesical symptoms were identical with those already described. Thirty out of 38 cases first reported sick on account of bladder trouble, not associated with any intestinal disturbance. Eleven of these on cross-examination denied all history of any intestinal trouble, although they were at the same time passing lateral-spined ova.

Even when present, intestinal symptoms were generally slight. These manifested themselves by a sense of rectal uneasiness, occasional attacks of diarrhœa with blood and mucus in the stool, but rarely accompanied with tenesmus.

The dysenteric attacks lasted from two days to three weeks or more, and were sometimes accompanied by emaciation. In the intervals between individual attacks the condition of the patient steadily improved, the only abnormality noted being the passage of solid stools with abundant yellow mucus.

Microscopic examination of the mucus revealed the presence of lateral-spined ova, and in four cases lateral-spined ova were present in the urine as well. The results of a systematically conducted blood examination in no way differed from that already described for *B. hæmatobia*.

The late symptoms of the disease, as in the case of *B. hæmatobia*, were not observed in British troops at this comparatively early stage. In the Egyptian fellaheen massive pedunculated submucous tumours and subperitoneal infiltrations form in the colon; the former by sloughing may give rise to extensive intestinal ulceration. A coarse "pipe-stem" periportal cirrhosis, first described by Symmers, is not very commonly observed at autopsy, but I believe that further investigation will prove that a finer grade of cirrhosis must exist in a large proportion of all *B. mansoni* infections.

It is hardly necessary here to point out that all these late pathological changes correspond with what is known to occur in *B. japonica* infections.

V. *Researches on the Pathological Basis of these Clinical Symptoms.*

For a correct appreciation of the differences of the clinical picture of these two diseases a careful study of the morphology and habits of the two species of trematodes is essential, as well as the morbid changes in the tissues of artificially infected monkeys.

Habitat.—The different distribution of the paired worms in the two species of infections is of considerable importance, as it explains the different anatomical situation of the pathological lesions. In *B. mansoni* the habitat in infected monkeys was the inferior and superior mesenteric veins and the portal system of the liver; in *B. hæmatobia* infection, while paired worms were found in the portal, inferior, and

mesenteric veins, they were present in the largest numbers in the pelvic plexuses of veins, the vesical and the uterine. From here worms may wander into the inferior vena cava and be actually filtered out in the lungs.

Though the adults of *B. mansoni* were never found in the latter situation, its lateral-spined ova were. On a priori grounds one would therefore expect the liver to be involved in monkeys, by both species of bilharzia, but pulmonary lesions to be mainly limited to *hæmatobia* infections. This actually is what one finds at autopsy in experimentally infected monkeys.

The mode of deposition of ova in the tissues.§—When the time for oviposition arrives the paired worms travel against the direction of the blood stream to the furthermost possible point. Here the female leaves the male partner, and being of a much narrower calibre migrates until unable to progress owing to actual mechanical obstruction. The ova are then ejected, with their spines directed posteriorly through the vaginal opening, which is situated immediately behind the ventral sucker, into venules of a diameter approximating to the diameter of their own. As the female withdraws her head the blood current tends to assume its normal course and thus forces the ovum onward, engaging its spine in the vessel wall. The blood now forces the ovum through the wall into the perivascular tissue. Hereafter its progression through the tissues is independent of the spine and is brought about by an active ulcerative process.

The capacity of the two species for producing ova.—*B. hæmatobia* has a much greater capacity for ovum-production than has *B. mansoni*. This is probably due to their anatomical characters, for *B. hæmatobia* has, on account of the situation of the ovary, a much greater uterine capacity than has *B. mansoni*. I have actually counted as many as 50 terminal-spined ova in the uterus of one female worm, while in the female of *B. mansoni* as a rule, only one ovum is found at a time. Occasionally, however, I have observed two or three ova in the same female worm. This latter fact may explain the greater severity of the localising symptoms of *B. hæmatobia* infections, as compared with those of *B. mansoni*.

Some explanation is obviously required, for in Egypt there exists a greater chance of infection by cercariæ of the latter species, which are much more frequently discovered in systematic snail dissection than are those of *B. hæmatobia*; in fact, on an average they are 18 times more common, and, moreover, *Bullinus* snails are much scarcer than are *Planorbis*.

The Investigation of 25 Experimentally Infected Monkeys.

Those animals hyperinfected with bilharziasis may die from two to five weeks from the date of infection, and prior to the deposition of ova in the tissues. Death in these instances was due to toxins elaborated by the maturing worms and was accompanied by complete suppression of the cellulo-humoral response (such as leucopenia, absence of eosinophilia, and complement-fixation reaction). The effects of these toxins on the tissues are shown by the cloudy swelling of the parenchyma of the glandular organs, such as the liver, spleen, and kidney, and by a round-celled periportal infiltration.

In less severely infected monkeys emaciation and general malaise may be observed as above, but they survive and localising symptoms appear. Furthermore, in these animals the cellulo-humoral response is marked. A high eosinophilia and a marked leucocytosis are present. The eosinophile myelocytes in the bone marrow are increased, and a positive complement-fixation‖ is obtained in 90 per cent. of cases. It is interesting to note that localising symptoms in the vesical form appear at least two weeks later than do dysenteric symptoms in monkeys experimentally infected with *B. mansoni*; in fact, terminal-spined ova may be found in the fæces of monkeys before they make their appearance in the urine.

Blood cultures from monkeys in the first two months are always sterile, thus disproving the suggestion of Archibald that febrile symptoms are due to secondary infection.

The Morbid Anatomy of Infected Monkeys about the Twelfth Week.

(*a*) B. hæmatobia *infections.*—On opening the abdomen the liver is found enlarged and congested and studded with whitish tubercles, 0·5–2 mm. in diameter, which are in reality minute abscesses composed of eosinophile cells. The spleen may be enlarged and congested. The colon is frequently thickened and subperitoneal and submucous nodules of 1–3 mm. in diameter have been noted. The omentum may form vascular adhesions to the outer surface of the colon and may tear on separation. The bladder may show massive papillomatous formations of from 5–8 mm. in height; the mucosa is dark red and engorged. On section the uterus in the female may present the same whitish nodes or nodules in the submucous zone. The lungs are often found to be affected with a condition resembling miliary tubercle.

Examination of the venous system shows paired worms in quantity in the liver, portal vein, mesenteric, and very especially the pelvic veins as well as in the inferior vena cava and pulmonary veins.

By using a modification of Ferguson's method of digestion with 3 per cent. caustic soda, the distribution of ova in the tissues was as follows: They occur in the greatest numbers in the bladder, the uterus, liver, lung, the small and large intestines, but they also occur in the lymphatic glands, spleen, and kidney.

(*b*) B. mansoni *infections.*—On opening the abdomen, again, the characteristic appearance is the large congested liver with similar whitish nodules. In heavily infected monkeys constant changes occur in the colon; in some cases the subperitoneal coat may be studded with minute nodules, in others various grades of inflammation of the intestinal submucosa may be manifested by congestion, increased mucoid secretion, minute ulceration, and scattered bilharzial tubercles. Actual papilloma formation was never observed. The lungs and bladder rarely show macroscopic evidence of the disease in this species of infection.

Ova are most commonly found in the liver, colon, and small intestine, and may also be demonstrated in the stomach, the duodenum, spleen, lymphatic glands, pancreas, lungs, and kidneys.

Microscopical pathology of the lesions of both species.—Microscopically, the characteristic features consist of an infiltration of eosinophile and round mononuclear cells. Actual softening may form in the centre of these whitish nodes (these are analogous to the eosinophile abscesses in trichiniasis). Giant-cell systems are commonly present in the vicinity of ova, and may actually form a plasmodial mass completely enveloping them. This type of cell reaction is to be regarded as a response to the mechanical irritation produced by a foreign body.

The distribution of the microscopic lesions in the body corresponds to the blood-supply; for example, in the liver it is the periportal zone, in the hollow viscera the subperitoneal and submucous coats. Ova in the tissues, as well as the adult worms in the veins, exert their influence by virtue rather of a toxic secretion than by any actual mechanical action. The cytological response to bilharzia toxins is the eosinophile cell. From these lesions ultimately granulation tissue is produced, and this is later replaced by fibrous tissue. The local tissue reaction and systemic response may be responsible for the death of ova as well as of adult worms in situ. Not infrequently such results are noted in microscopic section.

VI. *Resume.*

As a result of these pathological and clinical studies it is obvious that bilharzia worms and probably also their ova exert their deleterious influence on the tissues mainly by toxic action. Such a view is inevitable when one considers:—

1. The nature of the early clinical manifestations both in man and in experimentally infected monkeys (obviously toxic in origin).

2. The nature of the pathological lesions demonstrable in monkeys dying two to four weeks after immersion and before ova are deposited in the tissues.

3. The type of cellulo-humoral response. Antibody can be demonstrated in the peripheral blood of infected monkeys and man by means of a specific complement-fixation test about to be described. The eosinophilia in bilharziasis and the excess of eosinophile myelocytes in the bone marrow can only result from chemiotactic or specific toxic action.

§ This theory was based on certain direct observations. The habits of the worms were studied in the mesenteric veins of infected and anæsthetised monkeys on which laparotomy was performed. Fresh pieces of bowel were examined microscopically by fixing between glass slides apposed by rubber bands. In this fashion the deposition of ova in the vessels in the various stages, as well as the actual mode of egress, were observed.

‖ To be described in detail later on.

VII. *The Complement-fixation Reaction in Bilharziasis.*

The frequency with which urticaria, fever, and other symptoms were observed in the early stages of bilharziasis first suggested to me the presence of some circulating toxin, the product of maturing or adult parasites. To demonstrate the presence of immune body against such a toxin I manufactured an antigen from the livers of snails (*Planorbis boissyi*) infected with *B. mansoni*, and utilised the method of complement-fixation first described by Bordet and Gengou.[25] In June, 1917, I was able to report to the military authorities the discovery of a positive complement-fixation test for bilharziasis.

Technique employed.—The most satisfactory antigen is prepared by macerating a number of infected livers in a quantity of absolute alcohol and thoroughly shaking on an electric shaker. This mixture is then stored for 24 hours at 37° C. and filtered. The filtrate is evaporated at 45° C. by means of a Sprengel's exhaust pump. The residue is dried, weighed, and made up into solution with 0·85 per cent. saline + 0·5 per cent. phenol (0·05 g. of residue to 20 c.cm. solution). The anticomplementary dose is then estimated and one-third this amount used in the test. Lately, as an alternative, I have adopted the simple procedure of diluting the concentrated alcoholic extract with saline and not evaporating to dryness. The results so far have been most satisfactory. Besides estimating the anticomplementary dose the antigen is always tested for hæmolytic tendency, as similar extracts of the livers of normal snails and also of those infected with allied cercariæ yield negative results; the antigen must be regarded as absolutely specific.

The general technique I now adopt is similar to that utilised for the Wassermann reaction and need not be described in detail. Racks with four rows of tubes are utilised, the first, second, and third rows containing 3, 5, and 7 M.H.D. of complement respectively besides antigen, saline, and diluted serum. The back row contains 3 M.H.D. of complement, but no antigen, and acts as a serum control. Antigen controls and sure positive and negative sera are always included in the system. The first stage of the reaction is conducted for one hour at 37° C. and then sensitised corpuscles are added, final readings being made at the end of another hour.

Results are recorded as P+, P++, or P+++, according to the number of tubes in which hæmolysis is completely inhibited. On an average, pooled positive sera collected from early cases of bilharziasis fix 7 M.H.D. of complement over and above that fixed by pooled negative sera in the presence of specific antigen. In more chronic cases this excess fixation amounts to about 4 M.H.D. of complement.

Analysis of results.—In 322 consecutive cases investigated by this test the following results were obtained:—

1. In a group of 36 cases whose bilharziasis was under two years' duration 32, or 89 per cent., yielded positive reactions.

2. In a group of 97 more chronic cases 72, or 74 per cent., yielded positive reactions.

3. In 44 cases of syphilis yielding positive Wassermann reactions negative results were always registered. In one case a P + reaction was obtained, but here there was anti-complementary tendency shown in the serum control tube.

4. In 150 other cases, which included protozoal, metazoal, and bacterial infections, negative results were uniformly obtained. In only one case was a positive result registered where ova were not found in the dejecta, but as only one examination was made, and as intestinal symptoms were present, bilharzia could not be here excluded. Probably the case was one of latent infection.

It is interesting to note that, as a general rule in bilharzial infections, the higher the eosinophilia the greater the amount of complement fixed. There are, however, many exceptions, and a proportion of cases without eosinophilia yield positive reactions.

The Practical Value of this Test is Twofold.

1. It affords a means of diagnosis, not only in latent bilharziasis, but also in very early stages of the disease prior to the onset of vesical or rectal symptoms. Thus in monkeys the reaction is generally well established by the seventh week (P+++ reactions).

2. It affords a therapeutic index to the effect of a given drug on bilharzial worms. In this respect the test should stand in the same relationship to bilharziasis as does the Wassermann reaction to syphilis.

VIII. *Prognosis.*

The experience of Smith[21] and Cottell,[27] based on bilharziasis contracted in the South African war, would suggest that the prognosis regarding life, in the milder grades of infection, is most favourable. As the majority of our soldiers who contracted the disease in this campaign were only occasionally exposed to infection those fell complications of the disease—malignancy and septic infections—are not so likely to ensue.

IX. *Reflections on Treatment.*

In the past it has been customary to estimate the therapeutic value of any drug in bilharziasis according to the following criteria: (1) the temporary disappearance of vesical or intestinal symptoms; (2) the diminution or cessation of the passage of ova in the dejecta. Such data, however, act as an index to the temporary amelioration of local conditions, but not to the cure of the disease. This information tells little concerning the fate of the true causal agents concerned—viz., the worms.

The recent advances in our knowledge of bilharziasis, however, now afford a scientific as opposed to an empirical basis for ultimate cure. Thus (1) the lethal action of various drugs in worms and cercariæ can be investigated in vitro; (2) monkeys can be readily infected and the effect of the intravenous injection of any drug which has been found to exert a selective lethal action in vitro tested; (3) the complement-fixation test (controlled perhaps by post-mortem examinations) can be used to determine the effect of the drug on the parasites, either in man, or in experimentally infected monkeys.

In 1917 I treated 4 cases with repeated intravenous injections of eusol with negative results, as indicated by the facts that the complement-fixation reaction and the eosinophilia were unchanged. On a priori grounds this result was to be expected, as, contrary to the findings of certain observers, I find that available chlorine possesses no special lethal effects on cercariæ.

Christopherson[24] has recently reported favourably on the treatment of bilharziasis with tartar emetic administered by the intravenous route. Further confirmatory evidence of cure, as controlled by the complement-fixation reaction and the demonstration of a specific or selective action of tartar emetic in high dilutions on the adult bilharzia and cercariæ in vitro, would be of the utmost value.

Benzene and thymol have been recommended by Robertson per os, but in the limited number of cases in which I have noted the effect of these drugs the results have been disappointing. Urotropin is indicated in certain secondary infections of the genito-urinary system, but, per se, it naturally can have no influence on the adult parasites since it does not liberate formaldehyde in the circulating blood. There is no unanimity of opinion regarding the results obtained by the subcutaneous injection of emetine hydrochloride in bilharziasis.

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ANTIMONY TARTRATE FOR BILHARZIASIS: A SPECIFIC CURE.

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WE have been treating Egyptian bilharziasis (vesical and rectal) at the Khartoum Civil Hospital by the intravenous injection of antimony tartrate as a routine method since May, 1917, and I think we are justified in saying that it not only kills first the parasite (*Schistosoma hæmatobium*) *in situ* but that later it kills the embryos in the ova deposited in the terminal vessels, and sterilises the ova so deposited, and that the patient is cured not only of his bilharzia parasites but that he ceases to be a bilharzia carrier and cannot propagate the disease.

On Sept. 7th, 1918, THE LANCET published a paper on this subject written some months earlier. Since that paper was written we at the Khartoum Civil Hospital have another series of cases to record which it is unnecessary to tabulate, but with reference to it I take this opportunity to make some further observations. The additional cases are about 30 in number, and in nearly every case which completed the course we can record satisfactory results.[1] The cases are the unpicked average cases such as one meets in hospital practice out here.

Treatment.

Regarding the treatment, the two important questions to be answered are: 1. Is antimony (tartrate) a specific cure for bilharziasis, and, if so, is the cure temporary, an apparent one only, or is it permanent? 2. Are there risks in the treatment, or disadvantages, which outweigh the very apparent benefits?

I have described the method of treatment elsewhere,[2] and it is unnecessary to say more than that the solution used is gr. ½ antimony tartrate in ɱ 20 distilled water. This is diluted again before injection with once or twice its quantity of saline solution, according to circumstances. Injections are made at first every day, afterwards every other day, with a 10 c.cm. record syringe, using a fine iridium-pointed needle into a prominent vein of the arm or elsewhere, and the doses are increased by gr. ½ (antimonium tartrate) each injection until gr. 2 (or sometimes gr. 2½) are reached, the total quantity of antimony tartrate making a course being 20 to 30 grains. The urine is microscoped every day. This last is important because the microscope is the only sure means of estimating the amount of the drug necessary to be given in any particular case.

I will not discuss now the local difficulties and the dangers of the injections. It is sufficient to say here that when accidents occur they are generally due to faulty technique. They will not occur if the following elementary facts are realised with their full significance: (1) that the injection must be into the lumen of the vein (injections into the tissues around the wall will not do at all); and (2) that the drug is a powerful one and must be used with caution.

In dealing with the treatment of bilharziasis one must remember the following points:—

1. That the majority of people who are infected with *Schistosoma hæmatobium* are themselves unaware of the infection, or only suspect it from the fact that they occasionally pass some visible blood in the urine, perhaps only during the winter. They are, however, pale and sallow and anæmic, and have muddy complexions and dirty-looking skins, &c.; the majority of Egyptian fellaheen are thus[3]—the majority have bilharziosis.

2. That the parent worms, often many hundreds in a single patient, are situated in the portal vein and its tributaries.

3. That the worms themselves produce no symptoms, excepting certain microscopic blood changes,[4] and perhaps anæmia, sallowness, dirty-looking skin, due to the worms extracting pabulum from the blood and depositing waste products thereinto.

4. That all the symptoms described are attributable to the mechanical effect of the *ova* which the female worm deposits in the terminal tributary vessels of the bladder and rectum, and sometimes conveys to other organs, such as liver, lungs, spleen, brain, and kidneys.

5. That these ova, working their way from the venule to the surface of the bladder and rectum in order to escape with the urine or fæces, act simply as so many minute foreign bodies, small, almost oval in shape, furnished with terminal or lateral spikes.

6. In making their way to the interior of the bladder and rectum in order to gain their freedom and undergo their destined development the ova may take months to do so.

7. That the ordinary uncomplicated case of bilharziasis lasts 10 years or longer, ova continuing to be found during this period, and live normal ova too. We do not know whether the *Schistosoma hæmatobium* lives for so long as this; it probably does, or longer.

8. It is stated by the highest authority that "no direct or other means is known by which the schistosomum can be destroyed.[5] In other words, there is no known cure for bilharziasis. This was true, excepting the fact that most cases of bilharziasis are cured by time. Let that pass. Now we think there *is* a cure, and apparently a sure cure—antimony tartrate.

9. The serious lesions of the bladder and urogenitary tract, the rectum, the liver, and other organs, are all attributable to the presence of the small foreign bodies—the ova. So that if one is able to kill the worm and poison and sterilise the ova deposited in the tissues, it may fairly be said that the patient is completely cured. The fistulæ, calculi, pyelitis, abscesses, and the other serious conditions so frequently associated with bilharzia, must remain to be dealt with by ordinary surgical methods. They are but incidental complications of bilharzia, no more.

I have written the foregoing because it may be objected that all the cases we have treated are, at most, severe uncomplicated cases, which is true, and that nothing is said of the complicated cases, which are the most serious. I would say, firstly, that these are the typical and much the most numerous of the cases met with, that it is even more important to cure a patient from the point of view of his being a carrier than from the point of view of his being himself infested with the bilharzia worm. There are

[1] Two small boys broke off treatment; in the one case because the mother thought him to be cured, and the other got influenza and did not resume treatment afterwards. The treatment does not appeal to small boys; they do not relish the painful process of having needles stuck into them. One boy, apparently cured, was found to be passing scanty ova, one of which hatched out; this was 15 months after the course. The boy was otherwise perfectly fit and had been so since the course, and his urine had been all along perfectly clear and normal-looking. It contained, however, a trace of albumin. Possibly the antimony had killed some of the parasites; some had escaped.

[2] THE LANCET, 1918, ii., 325.

(*Continued from preceding page.*)

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[3] The ordinary Egyptian fellah is a flabby, sallow individual, though physically a fine-looking specimen of humanity, and his meekness and weakness of character and lack of initiative are probably attributable to his handicap by his parasites.

[4] Slight general leucocytosis and marked eosinophilia (23·7 per cent.), THE LANCET, 1911, ii., 1328 (Dr. H. B. Day).

[5] Text-book on Tropical Diseases, Manson, 6th edition, 1918, 754.

thousands of these mild untreated cases walking about, having infinite opportunities to spread the disease, and these are the important cases to handle in order to stamp out the disease by dealing with it at its source.

The so-called bad cases are really not bad because, *ipso facto*, they have bilharzia, and, so far as the parasites and ova are concerned, the antimony tartrate, I trust, will be found to act on them in the same way as it does on the parasites of the uncomplicated case; but whether the complicating lesions themselves improve will depend on ordinary surgical conditions—this does not affect the present issue. I have had no experience in the use of antimony tartrate in such cases, but my opinion is that so far as the parent worms and the ova are concerned it will behave in the same way in such cases as it does in the ordinary case. But with these complications are found unhealthy organs such as the kidneys, and enfeebled constitutions, and this fact will necessarily compel the greatest circumspection when a powerful drug such as antimony tartrate is used in cases with unsound organs and in cases where there is debility.

What is the total amount of antimony tartrate necessary to complete a cure?

Two objects are to be kept in view when answering this question—(1) to kill the parent worms in the portal circulation, and (2) to sterilise, *in situ*, the ova which have already been deposited when (1) takes place. This latter is the more important of the two objects, because, if accomplished, the patient will be unable to infect others. As the parent worms in the portal circulation cause no symptoms which we are able to appreciate as characteristic, there is no way of telling with certainty in an untreated case whether the worms are alive or dead; but in a case undergoing treatment by antimony we can base an argument on the condition of the ova discharged, whether they are sterile or not, by carefully watching their appearance and behaviour in the diluted urine. If our observations up to the present are correct that the ova resist the action of the antimony longer than the parent worm, then we may assume that when we have succeeded in sterilising the ova we have also succeeded in killing the worm. We have found, after about gr. 12 had been injected in about as many days, that *some* of the ova were shrunken, shrivelled, blackish, and the contents granular, and appear as if they had been oxidised, and that these would not hatch out in water however long they were left. As injections proceed an increasing proportion of the ova eliminated are granular and dead. Now when it has been confirmed for two or three days that none of the ova hatch out, then the time has come to suspend the injections, for both objects (1) and (2) have been accomplished. The patient is cured of his schistosome parent worms, and, in addition, he has ceased to be a bilharzia carrier. From observations on our cases I think that this takes place after about gr. 20 have been injected, but it may be less, and it probably varies in different cases. The microscope is the only reliable indicator.

Suspected Relapses.

After the administration of antimony tartrate suspected relapses may be (1) true relapses or (2) apparent relapses. True relapses may conceivably be due to the several causes mentioned hereafter, but the apparent relapses, (2), are, I think, much more interesting, and with reference to them, remembering that the *ova* are the cause of all the symptoms usually described in bilharziasis and that they act solely as foreign bodies, they will, whether dead or alive, still go on producing symptoms as they work their way through the tissues in the process of elimination. So the presence of some blood, a little albumin, and *dead* ova does not necessarily mean that the patient has not been cured.[6] The fact that a man is passing ova in urine is no criterion that he harbours *live Schistosoma hæmatobium* or that he is capable of passing on his bilharzia to others. The practical point is, Are the ova alive and normal or dead and sterile?

I have elsewhere[7] pointed out the persistence of ova in urine or fæces, or the recurrence of ova after the dose which is usually fatal to the parasite has been given. Personally, I do not think a real relapse often occurs if gr. 25 have been given. If it happens, conceivably it may be due to the following causes: 1. Sufficient antimony tartrate not having been given to kill, but only sufficient to suspend the activities of the *Schistosoma hæmatobium*. 2. Some of the worms may have been killed, but the more hardy ones may remain and continue to deposit ova which continue the symptoms. 3. It is conceivable that recurrence of ova may be due to the worms, having disappeared for a time from the terminal venules on account of the action of the antimony on the mucous membrane of the bladder and rectum, return again when local conditions become more favourable. 4. Showers of live normal ova may come through for a considerable time after the death of the worm. These, deposited before the death of the schistosome, come through gradually. When this occurs the patient is only partially cured, because although the parent worms may be dead he can, under favourable conditions, still pass the disease on to others, and he will remain a bilharzia carrier probably for some months. 5. Lastly, it may also be accounted for by the failure of the antimony to affect the worm at all.[8] All the foregoing may be considered true relapses, and (3) is the most elusive, and I believe that (2) is the most likely to occur, or possibly (4).

Illustrations from Cases.

The question of apparent relapses was well observed in the case of a boy who had had bilharzia (vesical) for four years, and who for three years had never passed water free from blood. The boy was a ward-worker at Khartoum Civil Hospital, and so could be watched for months after the course of injections was completed. He had gr. 30½ in all in 28 days, but after gr. 12½ had been given all his symptoms cleared up, and he expressed himself as cured and free from any subjective symptoms at all. His urine, however, although quite clear and free from visible deposit, and in other respects normal, contained frequently ova in scanty numbers and a little microscopic blood, but some of the ova passed after about gr. 12 had been given, and all the ova later were small and shrivelled, irregular in outline, with a thick, uneven contour, instead of a sharp, thin, even double contour, and the contents were granular, instead of presenting the usual outline of premature organs. They were black, as if oxidised—in other words, comparing them with those passed by the same patient *before* treatment, or those passed by any bilharzial patient with the disease *untreated*, the ova were different. They were, in point of fact, dead ova, and therefore could not be hatched out by the addition of water to the specimen.[9]

For a considerable period (four or more months) after the presumed death of the parent worms ova *are* passed which have been deposited in the tissues before the death of the worms. These residual ova die in the bladder or rectal tissue in time, either naturally or killed by the antimony tartrate, and though dead they will find their way through the mucous membrane of the bladder or rectum. Therefore the presence of ova in the urine is no criterion that the parent worms are not dead or that a cure has not been effected.

The important factor is not, Does the urine still contain ova? It is, What is the condition of the ova which are being released in the urine—are they normal, or are they sterile and merely foreign bodies in process of elimination? If they are sterile they are harmless, and the person who is excreting them is no longer a bilharzia carrier. The patient, if the ova are dead, is practically cured. The black, amorphous-looking, sterile ova have not died of inanition; they have, presumably, like the worms, been poisoned and killed by the direct action of the antimony tartrate. It will be found that for a few days after the injection has been commenced the ova are normal-looking, alive, and behave like bilharzia ova are expected to do, but a time comes when some do not hatch, and later (it may be about 14–18 days after the injections were commenced, after about gr. 20 have injected), when, although showers of ova occur in the urine almost daily, all are dead.

This leads to the consideration of another point. What is the killing "charge" of antimony tartrate in grains?[10] The

[6] The presence of a little albumin and *live* ova would, on the other hand, make one certain that the case was not cured.

[7] THE LANCET, 1918, ii., 325.

[8] In order to make the answer to the question of reappearance of live ova in the urine complete the possibility of a fresh infection may be mentioned.

[9] Bilharzia ova left in urine or fæces as passed do not hatch out, otherwise miracidia would be found in the bladder or rectum of bilharzia patients. If water is added the ova will hatch out in a few minutes. There are certain simple facts of interest and practical value connected with this. If tap water of the temperature of 50° or 55° C., or 130° F., be added, the ova hatch out in three or four minutes. If colder water is used they take longer—three or four, or even more, hours. Miracidia keep alive and active for six or seven hours if left at the temperature of the Khartoum atmosphere, 90°–100° F., but they do not, in my experience, live for 24 hours as is stated. They live for nine hours at the outside.

[10] The quantity necessary to kill both parent worms and deposited ova.

total of gr. 25 to 30 for a course of injections which we have elsewhere laid down was suggested rather as a maximum dose advisable in one course; the absolutely necessary killing dose is probably smaller, perhaps much smaller, and probably it varies for different patients. The right dose to give will doubtless be discovered by experience, but in the meantime we continue the injections until what we see under the microscope tells us that no more are necessary. The less antimony introduced into the human body the better; it is a poison when all is said and done, and, incidentally, medication by the process of introducing needles into veins is an unpleasant one, and should be practised as little as possible.

At what stage do the parent worms in the portal vein die?

A man who has had hæmaturia for six years passes ova constantly which will hatch out under favourable conditions in three or four minutes.[11] When he is injected with antimony tartrate for *four* days this same process takes place, but on about the fifth day after, roughly speaking, gr. 3½ have been injected, a very noticeable change (first improvement) takes place in the appearance of the urine; it clears up considerably and becomes free from visible blood; microscopic blood remains. Again, after about gr. 12 have been injected another (second) improvement is noticed in the appearance of the urine; some of the ova will not hatch out and there is a distinct change in their appearance. Some of the ova are to all appearances the same as before, but some are granular, smaller, and more shrunken, and rigid and frozen-looking, others are distinctly tinged with and stained black.

Does the first change in the urine denote the death of the parent worm? Perhaps it does. The second change certainly denotes the time when the ova are being affected by the antimony.[12] The ova are deposited in the small venules and so are directly affected by the antimony in the circulation. Possibly this is explained by the fact that antimony is a cumulative poison, and when the antimony circulates in the blood at a certain concentration the environment of both worm and ovum becomes sufficiently poisonous that they die, the worm first, later the more resisting ovum. This poisonous concentration of the blood is, expressed in grains, given by intravenous injection, the required dose. It may be, and probably is, a good deal less than 25 or 30 grains, and it probably varies according to circumstances, &c.

I am of the opinion that antimony tartrate given by intravenous injections, as described in THE LANCET of Sept. 7th, 1918 (p. 325), with due care and circumspection and with due regard to the fact that it should only be given with the greatest caution when any important organs—kidneys, liver, heart, lungs, &c.—are not sound, is a radical cure for bilharziasis, and that it may safely be employed. It has, however, a cumulative action, and it acts over a long period owing to its slow elimination from the tissues of the body, although be it stated that antimony is found in the urine after only gr. ½ has been injected.

The cases which have formed the basis of this paper have been under the care of Dr. Ferid Masoud, medical officer at the Khartoum Civil Hospital, who has done for me many of the injections and in other ways assisted me, and I have especially to thank Mr. J. R. Newlove, pathological assistant at the hospital, who made the daily microscopical and other examinations of the urines with so much skill and enthusiasm, and who devoted so much of his time to the work.

Khartoum.

[11] The patients on whom these observations were made were not kept in bed or "dieted." They were up and about in hospital.

[12] In some cases of untreated bilharzia "black" ova are occasionally met with, but not at any time in the same numbers as in cases treated with antimony.

THE trustees of the Peter Coats's Trust have contributed £1000 to the endowment fund of the Lord Mayor Treloar Cripples' Hospital, and £1000 to the Royal National Hospital for Consumption, Ventnor.

THE MEDICO-LEGAL SOCIETY.—The annual general meeting of the society will be held at 11, Chandos-street, Cavendish-square, London, W., on Tuesday, June 24th, at 8.30 P.M., when reports will be presented and officers and council elected for the session 1919-20. At the conclusion of the general meeting a paper will be read by Dr. Lionel Weatherly, entitled "A Point of General Importance—the Interpretation of Secs. 47 and 321 (ii.), The Lunacy Act, 1890."

AN ATYPICAL STRAIN OF *B. PARATYPHOSUS B.*

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THE atypical characters found in a micro-organism temporarily classified as a strain of *B. paratyphosus B* isolated by Dr. Lagane and myself from the blood of an enterica patient, who showed characteristic clinical symptoms of such an infection, appear worthy of recording, and bring forward an example of the marked variation that exists amongst strains within a group of micro-organisms.

Results of Tests.

In the serological examinations upon this strain it was found at the time of isolation that the serum of the patient agglutinated an emulsion thereof and an emulsion of a stock strain of *B. paratyphosus B* almost immediately by my rapid slide method in low dilutions and to a high titre by the long method, while having no action upon *B. typhosus* and *B. paratyphosus A*. The blood sera of a considerable number of other patients suffering or convalescent from enterica infections have been tested while comparatively employing an emulsion of this strain and of a typical strain of *B. paratyphosus B*, and the like results have shown the sensitiveness and specificity of its agglutinability.

It was frequently employed to compare its action with that of typical strains of *B. paratyphosus B* when direct and cross absorption tests were made; and again the results were similar. Absorption and agglutination tests were carried out upon it and a typical strain of *B. Aertrycke* and one of *B. Gaertner*. They showed it to have characters that distinguish it from these allied groups.

The results from serological tests lead one to classify, at least temporarily, this strain in the group of *B. paratyphosus B.*

When submitting it to the usual fermentation tests it produced the fermentation changes characteristic of the *B. para B* group, save that no acid or gas was produced in dulcite peptone water when kept at 37° C. or at laboratory temperature for two months. A subculture was sent to Colonel (then Major) Lyle Cummins, A.M.S., at the R.A.M. College. He also found that dulcite remained unfermented.

It is also non-motile, and is therefore a strain that failed on isolation in two of the characters common to the group. After subculturing on Witte's peptone broth agar during five years it has not altered in biological characters.

Fermentation Tests.

The following experiment, which on thrice repeating gave similar results, showed that the property of dulcite fermentation may be so developed as to slowly, and then readily, show its action. The medium employed was a solution of 2 per cent. dulcite (Paulenc Frères, Paris) in peptone (Witte) water with litmus (prepared by Kubel Thieman's method) as an indicator. All subcultures were kept at 37° C.

First subculture*	...	...	No change in 2 months.
Second	,,	(1)†	... ,, ,,
Third	,,	(2)†	... Slight acidity fourth day. No gas. No further change in 2 months.
Fourth	,,	(3)†	... Acidity net and trace of gas third day.
Fifth	,,	(4)†	... Acidity 24 hours, with trace of gas 48 hours.
Sixth	,,	(5)†	... Acidity 24 hours, with gas 48 hours.
Seventh	,,	(6)†	... ,, ,, ,,
Eighth	,,	(7)†	... ,, ,, ,,
Ninth	,,	(8)†	... ,, ,, ,,

* The first subculture was in dulcite from agar and the remainder in dulcite from dulcite. † After 7 days.

A similar experiment made with a subculture after sowing for three weeks in bile gave identical results. Another experiment made by making daily subcultures from dulcite to dulcite showed that the production of acid appeared in the fifth subculture after 14 days, in the sixth after four days, in the seventh after three days.

All the above cultures and others made in series of broth, agar condensation water, bile, and peptone water were examined after 18, 24, and 48 hours, and occasionally when older, but no motility of the strain has been seen.

Subcultures on agar made monthly from the above No. 9 dulcite-fermenting subculture during the last six months

have retained to the full this property during the last three years.

Further Tests.

Three series of experiments to test for the direct development of the property of dulcite fermentation and motility by culture of the strain in mice were made. The culture of the blood of the first mouse sown direct into dulcite peptone water produced no change, that of the second mouse (first passage) gave similar results, but that of the third mouse (second passage) produced an acid change in 24 hours and a trace of gas also in 48 hours. No motility of the strain was obtained.

Michaelis acid agglutination test gave a negative result.

Morphologically this strain since isolation and on all the media employed for its growth has been relatively longer by half than a typical *B. paratyphosus B* grown under the same conditions. When inoculated into man it produced antibodies specific for typical strains of the *B. paratyphosus B* group, as also for itself. These have been recorded in detail (Strain *B. paratyphosus B* "M").[1]

The virulence for the mouse when injected subcutaneously corresponded to that of typical strains and gave rise to a generalised septicæmia. 0·25 c.cm. of broth culture always killed in 24 hours. Given orally the results were negative.

Of some hundreds of strains of *B. paratyphosus B* isolated and tested by my colleagues or self in France, Malta, or Italy, no other strain of the group of *B. paratyphosus B*, or of the groups *B. Aertrycke* and *B. Gaertner B*, has failed to produce readily acid and gas in dulcite media from its original culture, and all have shown motility, and these characters have persisted when any later subcultures were tested.

I beg to thank Lieutenant-Colonel J. W. West, C.M.G., R.A.M.C., for permission to publish this article.

A CASE OF

MEDULLARY SYMPTOM-COMPLEX

DEPENDENT ON A LESION (? HÆMORRHAGIC) OF THE LEFT POSTERIOR INFERIOR CEREBELLAR ARTERY.

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THE following is a summary of the condition of the patient, a female, aged 47, laundress, single, after she had been taken ill on August 25th, 1916, and transferred to Eltham Cottage Hospital a few days later.

Left-sided occipital headache the only premonitory symptom. Acute onset, without loss of consciousness or convulsion, but with vomiting (once), persistent uncontrollable hiccough, tinnitus (left ear), and intense giddiness; forced movements towards left, left-sided cerebellar hypotonia and ataxia (slight), with nystagmus on looking to left; inability to swallow, with paralysis of left vocal cord, dysarthria and paralysis of palate (R. and L.); left pseudoptosis, enophthalmos and small pupil; paresis of left sterno-mastoid and trapezius; analgesia and thermo-anæsthesia right side of body and face, and left face. Tactile sensibility, joint sense, vibration sense, all normal. Hypertrophied heart; high systolic and diastolic blood pressure, no albuminuria; Wassermann reaction negative.

The onset is best described in her own words:—

"I was getting into bed and suddenly felt very queer. Something seemed to click in my head and I felt myself suddenly being pushed violently towards the left and almost thrown on to the bed, which seemed to rise up and meet me. I was unable to stand up. There was a loud buzzing in my left ear. I became breathless. I could not see. I thought I was paralysed down my left side and found I could not swallow. I could not speak."

At our examination on August 30th a tentative diagnosis, lesion of the left posterior inferior cerebellar artery, was made. A second, more detailed examination on Sept. 7th, confirmed this diagnosis, when the following notes were made. General condition slightly improved, no fever throughout. Headache slight, only severe as premonitory symptom. Hiccough, very distressing symptom at onset, now ceased. No return of vomiting. Oral sepsis marked. Tongue clean, protruding normally, neither tremulous nor atrophied, symmetrically disposed in floor of mouth. Now prefers to feed herself with œsophageal tube. Any voluntary attempt to swallow, fluids or solids, still quite impossible. Ocular movements full. No diplopia. Coarse slow nystagmoid jerks on looking to left. Left lid much drooped (= pseudo-ptosis), left palpebral fissure smaller than right. Left pupil now larger than previously, reaction to light now sluggish, outline irregular, cornea steamy, iris muddy, ocular conjunctiva still intensely injected. Low grade of iritis now present. Condition quite painless; douching eye painless; visual acuity, R. = good; L., previously good, now impaired. R. fundus (dilated pupil) normal; imperfect view of left obtained now, previously normal. Owing to iritis no attempt made to test skin pupil reflex. Voice less husky, but speech, though trifle "thick," quite intelligible to a stranger. Complete paralysis of left vocal cord persists. Palatal reflex (R. and L.) not obtained. On phonation R. palate only moves slightly. Left sterno-mastoid and trapezius (upper part) definitely flabby and paresed, though not to same extent as previously.

Patient still feels she must lie with head turned towards left side of pillow; cannot sit up alone and still tends to incline heavily to left when propped into sitting posture. Has made no attempt to stand. Is no longer giddy when attempts to sit up with assistance. Limbs now seem natural to her. Movements of left arm and leg slightly incoördinate as at previous examination. Nose finger test on left imperfectly executed. No static or intention tremor. No involuntary movements or dysdiadocokinesia. No gross evidence of cerebellar asynergia or dysmetria can be elicited. No motor deficiency. ? Slight hypotonia of left upper persists. No muscular wasting. No return of tinnitus. Can hear a watch well, better on left (history of right ear discharge some years previously). Muscles supplied by motor. V. normal. No facial paralysis or paresis.

Reflexes deep and superficial, normal, except slight relative diminution, at onset, of left knee-jerk and sluggish abdominal reflexes throughout. Lack of perspiration on affected side of face, symptom not infrequently seen in this type of case, not present. No attempt made to produce reflex sweatings. Salivary secretion appears normal. Vigorous pin-pricks on analgesic parts (skin) at no time produced bleeding. Comparison of temperature in right and left axilla not tested. No trophic or vaso-motor changes noted. Sphincters normal.

The sensory side.—Subjectively: Patient states left side of my face "burns" sometimes; on other occasions it feels "numb like menthol." This sensation increased by rubbing part with handkerchief. No abnormal subjective sensations on right side. Objectively: Tactile sensibility (tested with camel's hair brush). Beyond definite blunting on left cornea and conjunctiva, tactile impressions appreciated normally, in all areas tested on both sides. Light touch on tongue, palate, and pharynx normal. Light touch, with cotton-wool, seemed just as "tickly" on either side of face and in either nostril. Tactile discrimination: Compass points appreciated normally on face; localisation of tactile stimuli normal on all parts. Joint sense and muscle sense: Normal everywhere. Tuning-fork: Vibrations of tuning-fork were appreciated quite well on both sides of body (limbs, face, and head).

Cutaneous pain (tested with sharp pin).—Right side of body (face, neck, and limbs) completely analgesic to pin-point, whatever degree of stimulus. Right tongue, palate, and pharynx also appear analgesic; except on trunk at level of fourth cartilage and on abdomen at level of umbilicus the analgesic area is bounded by middle line. At these areas mid-line was encroached upon to ½ in. Each stimulus felt as a touch and accurately localised. On left side of face (peripheral trigeminal area) and on ear pin-point caused no sensation of pain. Response to pin-point over left posterior end of lower jaw, neck, limbs, and trunk normal. Left tongue, inner cheek, pharynx, and palate analgesic. Pulled hairs (right and left) on forehead, caused no pain. "She can just feel it."

Pressure pain (tested with blunt, rounded end of whalebone knee-jerk hammer).—Some conflicting results. Very firm pressure, even to extent of producing pitting of skin, on any part of body, face, forehead, and limbs, did not give

[1] Paratyphoid Inoculations, THE LANCET, 1914, ii., 743.

rise to painful sensation. Tested with same pressure on ourselves, it was certainly associated with sensation of discomfort and even pain. Pinching of calf muscles (right and left) and tendo Achillis forcibly also appeared to be tolerated in an abnormally insensitive way. Pinching tongue on either side, even forcibly with dressing forceps, not associated with any unpleasant degree of pain. A rubber tourniquet applied to right upper arm for bleeding gave rise to no discomfort at all. When the blood pressure was being tested pressure of inflated armlet was appreciated normally on left; on right side patient was obviously less intolerant, and on cross-examination she said: "I feel it less."

Cold (tested with lumps of ice in test-tube).—Right side: On whole of right side of body, with exception of small patch on right forehead and on cheek just below right eye, ice-cold is not appreciated normally. "It all feels ordinary" or "not at all cold." Left side: On left side of face (peripheral trigeminal area) same result as on right half of body. On excepted areas cold was referred to as "tepid," and though imperfectly described gave rise definitely to a different sensation from that produced on other parts of the right face, body, and limbs. On left neck, left trunk, and left limbs ice-cold gave rise to a normal sensation.

Hot (tested with water at 110° F. in test-tube).—On left face (peripheral trigeminal area), on right face, except just above and below eye, neck, trunk, arm, and leg, water at this temperature was referred to as "only tepid." On excepted area, water at 110° was referred to as "not so hot as on left arm" (standard of normal). On left neck, trunk, arm, and leg, sensation of heat was clearly differentiated in normal manner. On abnormal areas stimulation with ice-cold water or water at 110° did not provoke any sensation other than that referred to—e.g., burning, numbness, or pain. In a similar manner, pinching or rubbing skin, except on limited area on face in the manner already mentioned, did not give rise to any other sensation.

Sense of taste (on carefully dried and protruded tongue).—On left half vinegar and salt-water were not correctly interpreted as such. On right side of tongue they were correctly interpreted, but, it must be confessed, with considerable hesitation. With sugared water (right and left half) patient could make no correct response at all.

Sense of form.—With the eyes closed, and when a safety-pin, hair-pin, and half-a-crown were placed in right palm, very definite hesitation in the correct interpretation of them was present. The same objects placed in left palm were quickly and correctly named. We are not prepared to interpret this result; the sense of form is usually not affected in this type of case.

Mentality.—Throughout a long examination patient experienced no mental fatigue. Most intelligent, and, for most part, very discriminating answers were given. Mental concentration and memory appeared quite intact. On testing sensory side of nervous system no delay between application of stimulus and response was seen at any time.

Additional Notes.

A thin frail woman, slightly cyanosed; condition of heart, noted on first occasion, was confirmed—viz., apex-beat in sixth space (five inches from middle line) with heaving impulse, action regular. Heart sounds clear. Since admission no respiratory distress or tachycardia, average pulse-rate 84; T. 97° to 98°. Lungs normal; abdomen normal. Urine still shows no albumin. No polyuria.

Blood pressure.—Right, blood pressure = 170 (systolic), 120 (diastolic). Left, blood pressure = 178 (systolic), 120 (diastolic) (taken immediately afterwards).

Diagnosis.

(*a*) *Ætiological.*—The absolutely abrupt onset is strongly in favour of a vascular lesion (e.g., a hæmorrhage). In the majority of cases published thrombosis appears to have been the diagnosis most favoured where an autopsy was not obtained. In our case the high systolic blood pressure must have an important bearing on causation, and it seems to us improbable, especially with such a high diastolic pressure, that thrombosis should occur. The lesion, too, would appear to have a wider (vertical) spread than is usual, and we assume that involvement of XI. cranial nerve can be explained in this way. As a rule this nerve or its nucleus is spared. The initial premonitory headache and the subsequent vomiting are in keeping with this diagnosis. In our opinion, then, the rupture of a small aneurysm, on the course of one of the main lateral end branches of this vessel, interfering with the parts usually supplied by it, appears to us to best explain the clinical picture in this particular case. An extra-medullary leak, the blood being extravasated by the side of the medulla, might be an explanation of partial involvement of muscles supplied by XI. nerve. There is, however, one anatomical objection to this—the hypoglossal roots which are situated also in this region would have been involved, in all probability, were this the case. On the other hand, if the main lesion is one of the left vertebral artery itself rather than its branch the nuclei which lie on the ventricular floor, including that of the XII. and mesial structures and the pyramidal tract, would have been involved as well. Embolism: In the absence of a definite focus for the origin of the embolus it seems to us this ætiological factor may be dismissed. Basal meningitis, tumour, or abscess can be excluded with confidence. Syphilis, it would seem, can be excluded by the history and negative Wassermann reaction.

(*b*) *Anatomical.*—The signs and symptoms are so characteristic of lesion in this part of the medulla that it seems useless to discuss the possibility of the lesion being placed elsewhere.

Comment.

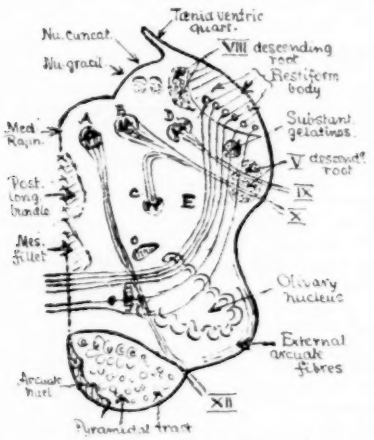
The type of case under consideration is by no means rare, and has been very fully described by Dr. S. A. K. Wilson. The case recorded by him corresponds in a remarkable manner with the one here described. We cannot attempt to analyse the details of our case with the wealth of knowledge and experience he brings to bear upon his own. The ætiological factor in Dr. Wilson's patient was a thrombotic one, the patient being a male aged 42. In our case hæmorrhage appears to us to be a more likely cause, for the reasons stated above. The character of the onset, however, and the initial symptoms are strikingly similar. In Dr. Wilson's patient the accessory nerve appears to have escaped. In our case partial paralysis of the sterno-mastoid and trapezius on the side of the lesion was present. We have already attempted to explain this point. The more persistent character of the symptoms seen in our case could be explained by assuming the presence of the hæmorrhage rather than a thrombosis. In his case the sensory changes on the right side of the face differed in certain respects from those seen in this patient. The subjective sensations in his patient were especially instructive. Those who are interested in the physiology of the lesion and its bearings on the question of epicritic and protopathic sensation must consult his able description in the paper referred to above.

The *anatomy* of the lesion, by comparison, is simple. (*a*) Vascular: The posterior inferior cerebellar artery is the vessel responsible. This vessel is clearly one of the most important branches of the vertebral (usually), but receives scant attention in anatomical text-books:—

> "It rises a short distance below the pons and passes obliquely backwards round the medulla oblongata, at first between the fila of the hypoglossal nerve and then between the fila of the accessory and vagus nerves, into the vallecula of the cerebellum, where it divides into lateral and medial terminal branches. The trunk of the artery gives branches to the medulla oblongata, and choroid plexus of the fourth ventricle. The medial terminal branch runs backwards between the inferior vermis and the lateral lobe of the cerebellum. It supplies, principally, the former structure and anastomoses with its fellow of the opposite side. The lateral branch passes laterally on the lower surface of the hemisphere and anastomoses with the superior cerebellar artery." (Cunningham's Anatomy.)

(*b*) Neurological: An analysis of the symptoms and signs will be made clear by reference to the accompanying figure, and can be summarised as follows: 1. The sympathetic phenomena (small pupil, pseudo-ptosis and enophthalmos, anidrosis and alterations in salivary secretion when present) are dependent on a lesion of the cervical sympathetic system, which extends upwards in the formatio reticularis of this part of the medulla. 2. The forced movements, giddiness, instability, nystagmus, and tinnitus are due to interference with the connexions of Deiters's nucleus and descending nucleus of VIII. nerve. The cerebellar symptoms, hypotonia, and ataxia are due to interference with the numerous afferent cerebellar systems, from spinal cord, olivary system, and other tracts passing towards restiform body. 3. A lesion of the descending root of V. nerve, its cells, and connexions (homo- and contra-lateral) will account for the dissociate

sensory changes on the right and left sides of the face, mucous membranes of the mouth and cheek. 4. Interference with the central connexions of the vago-glosso-pharyngeal and accessory nuclei, nucleus ambiguus, tractus solitarius, their nuclei and cells, motor and sensory, will account for the weakness of the palate, loss of taste, paralysis of the vocal cord, weakness of the sterno-mastoid and trapezius, and visceral signs, such as tachycardia, hiccough, dyspnœa, &c. 5. It will be noted that the functions of



Composite diagram of the medulla to show the structures involved and those which escape in a lesion of the posterior inferior cerebellar artery. A, Hypoglossal nucleus. B, Vagus nucleus. C, Nucleus ambiguus. D, Tractus solitarius. E, Reticular formation.

the XII. nerve (tongue muscles), the motor portions of V. nerve (movements of jaw), VII. nerve (movements of the face), the cochlear portions of the VIII. (hearing), and ocular nuclei escape. The lesion is extra-pyramidal, the pyramidal fibres being internal and ventral. 6 In this region the medium fillet (mainly concerned with the conduction of impulses from muscles and joints) coming from the spinal cord, with the paths for cutaneous touch, vibration sense and pressure pain, escape. These lie nearer the middle line, and this explains the absence of anæsthesia, &c. On the other hand, the paths for temperature (hot and cold) and cutaneous pain, which lie nearer the periphery, in the reticular formation, are characteristically involved.

In conclusion, it may be said that a lesion of this vessel produces one of the most characteristic crossed paralyses and dissociate anæsthesia which occur in clinical medicine, and although a previous case has never been seen, can be recognised immediately and diagnosed with confidence.

References.—1. Wilson, S. A. K.: Proc. Roy. Soc. Med., vol. ii., part ii., 1909, pp. 52–75. This paper contains the most important references bearing directly or indirectly on this subject. 2. Occlusion of the Posterior Inferior Cerebellar Artery, Andrew G. Gillis, Journ. Amer. Med. Assoc., 1914, lxiii., Oct. 31st, p. 1550. 3. Occlusion of the Posterior Inferior Cerebellar Artery, Herman Gordinier, Albany Medical Annals, October, 1911, p. 585. 4. Occlusion of the Posterior Inferior Cerebellar Artery (Report of Case), G. W. Robinson, Journ. Amer. Med. Assoc., 1913, lxi., July 19th, p. 179. 5. A Case of Thrombosis of the Vertebral and Posterior Inferior Cerebellar Arteries, A. Salmon, Lo Sperimentale, 1913, lxvi., p. 442.

THE ELIZABETH GARRETT ANDERSON HOSPITAL APPEAL.—Some £6000 are still required to complete the £50,000 asked for in the appeal inaugurated by Lady Hall, of Dunglass, in 1916 for the endowment of this hospital as a memorial to the founder. As the committee are anxious to close the fund in the autumn an urgent appeal has been issued for subscriptions, which should be sent to the hospital, Euston-road, and will be acknowledged by Lady Hall.

BONUS TO NURSES IN SOUTH AFRICA.—The Kimberley Hospital Board, not having been permitted to grant a bonus to their nursing staff in recognition of exceptional services rendered by them during the recent influenza epidemic, a public fund was opened, and a sum of £700 raised by the people of Kimberley. This money was distributed on Wednesday, May 7th, among nearly 70 sisters and nurses, the presentation being accompanied by the payment of high tributes to the work of the hospital nurses during the influenza crisis.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF

PERFORATING WOUND OF THE HEART.

BY F. C. PYBUS, M.S. DURH., F.R.C.S. ENG.,
MAJOR, R.A.M.C.(T.).

IN addition to many medico-legal points this case presents features of general surgical interest, and seems worthy of record. The patient was stabbed in the neck and back and four times in the thorax. Pneumothorax was produced on each side. Three of the four thoracic wounds were over the heart; one of these produced pneumothorax, opened the pericardium, and penetrated the left ventricle, which was sutured about two hours later. Nevertheless the patient survived for five days, then dying from septic infection of the pleuræ and pericardium.

Notes of Case.

Leading Seaman H., aged 28, was admitted to the 1st Northern General Hospital about 2 A.M. on June 21st, 1917. He, with some companions, had been dancing and drinking in a house. A quarrel arose, during which a knife was used. His companions left, and on returning with the police the patient was found lying on his face in the yard of the house. He was unconscious and had several stab wounds about him.

On admission he was conscious, but collapsed. A rapid survey in the receiving room revealed several wounds, from one of which, over the heart region, air and blood was escaping. Two sutures were placed in the wound. On removal to the theatre the following wounds were found: 1. A punctured wound in left side of neck behind the sterno-mastoid muscle which was bleeding slightly. 2. An incised wound over inner part of left sixth interspace 1½ in. long and internal to the nipple. 3. A small punctured wound just below left nipple. 4. A small punctured wound over ninth rib in left nipple line. 5. A wound 2 in. long over eighth rib in right mid-axillary line from which blood and air escaped. 6. A wound 2 in. long over erector spinæ muscle in the left lumbar region.

Wound 2 appeared the most serious and a heart injury was suspected. As the whole of this region was emphysematous no exact knowledge of the size of the pericardial sac could be obtained.

Operation.—Open ether was administered and the whole chest was cleaned. When the sutures in Wound 2 were removed blood and air escaped. On separating the edges the sixth costal cartilage was found cut across, as also were the soft structures adjoining. The pericardium was visible, as was also the lung, which was partly collapsed and surrounded by blood. Wounds 2 and 3 were joined by an incision, which was also prolonged upwards, downwards, and outwards, making a large flap. The soft structures of the flap were separated from the ribs, and the sixth costal cartilage was divided near its junction with the rib. The fifth costal cartilage was also divided near the sternum and the whole flap turned outwards.

A hole 1 in. long was found in the pericardium from which frothy blood escaped. No heart wound could be seen through this opening, so it was enlarged. This revealed a wound on the front of the left ventricle ½ in. long adjacent to the coronary artery running in the inter-ventricular groove. This wound was bleeding slightly; it appeared to be non-penetrating, and it was thought that the blood might be coming from a cut branch of the coronary artery. The heart was steadied and two catgut sutures inserted in the ventricle which closed the wound and controlled the hæmorrhage. The pericardium was now cleaned of blood and the wound in it closed. As much blood as possible was mopped from the left pleura and some saline introduced into the pleural cavity. The flap of chest wall was replaced and sutured in position, making the left pleura air-tight.

The neck wound was then cleaned and sutured. The wound of the right side of the chest was found to open the pleura, and the diaphragm could be felt through the puncture. There was a partial collapse of this lung, with pneumothorax. The bleeding appeared to come from the wound margin, which was then sutured.

Wound 6 passed through the erector spinæ and entered the right perinephric tissue, but no further damage appeared to have been done. Morphia was given and saline by the rectum, and the patient was put to bed in fairly good condition.

When seen at the morning visit at 10 A.M. he was rational and seemed comfortable. After this he seemed quite comfortable, except for some embarrassment of respiration, such as one might expect from a double pneumo- and hæmo-thorax. The pulse varied from 116 to 148, the respirations from 30 to 50, and the temperature from 99° to 103° during the five following days. About 4 A.M. on the fifth day he appeared to have a faint, from which he rallied. Later, about 6 P.M., he again collapsed and died suddenly.

Post-mortem examination.—All the wounds seemed to be healing naturally. Both pleural cavities contained blood-stained fluid, recent pleurisy on each side; left lung largely collapsed. Both bases were congested and almost airless, though each seemed to have escaped direct injury. The right lung contained a suppurating infarct. Pericarditis was present; excess of fluid; whole surface covered with lymph. On separating the lymph from the heart the wound with its sutures was seen. On opening the heart the left ventricle was found to have been penetrated. A small clot occupied the bases of the musculi papillares, which were themselves partly cut through. On removing the sutures a blade of the scissors could be passed through the heart wound into the ventricle. The basilar and carotid arteries were occupied by white thrombus, but no embolism could be found.

Remarks.—It is, perhaps, not surprising that the patient died after such injuries, but for four days at least recovery seemed quite hopeful. Contraction of the heart muscle must have accounted for preventing immediate death, while clotting round the bases of the papillary muscles must have also prevented any further escape of blood. The bleeding from the heart as described was not alarming, and the opinion that it came from a branch of the coronary artery seemed natural. The heart beat made no appreciable difference to it. The fact that the patient was found lying on his face may, by pressure on the external wound, have diminished bleeding by increasing the intrapericardial tension. The weapon which it is alleged produced the injury was a long-bladed pocket-knife, and presumably caused the infections. It was impossible to determine definitely whether pressure, infection, or embolism caused death. The suddenness of onset suggested the latter, but the post-mortem appearances did not definitely confirm this and rather suggested the former assumption. I have to thank Lieutenant-Colonel D. Wells Patterson, R.A.M.C.(T.), for his permission to publish this case.

Newcastle-on-Tyne.

A CASE OF
TERATOMA OF TESTICULAR RELIC,
THROWING LIGHT ON THE ORIGIN OF PEPTIC ULCER.

BY JAMES TAYLOR, F.R.C.S. EDIN.,
MAJOR, R.A.M.C.; DISTRICT CONSULTING SURGEON, ALDERSHOT COMMAND.

THE cause of gastric ulcer has been much discussed and many theories have been advanced. A case recently under my care seems to throw some light on the subject.

A. B. was admitted to hospital complaining of irregular attacks of severe pain in the epigastrium of two years' duration and recently becoming worse. This pain, which shot through to the back, did not seem to have any definite relation to the taking of food; it frequently came on in the night. It was accompanied by nausea but no vomiting. The bowels were constipated; no melæna. During the previous year he had lost 14 lb. in weight. The patient looked thin; tongue furred. Tenderness over duodenum, but none over McBurney's point or end of ileum. X ray examination showed a stomach of normal size, contracting well. There was an hour-glass constriction that persisted through all the examinations; some of the meal still in the stomach after 7½ hours.

Laparotomy was performed and a large ulcer found on the lesser curvature close to the cardiac orifice, but actual organic constriction was not present. The duodenum was more dilated than in any case I have seen; it was somewhat congested; no evidence of ulceration. Behind the peritoneum at the duodeno-jejunal junction, and partly obstructing it, was a rounded cystic swelling about the size of a duck's egg. It was closely applied to the front of the aorta and had a communicated pulsation from it. This obstructing tumour was carefully separated from the aorta and removed and the ulcer excised. The appendix was removed, but it was not inflamed and was in no way obstructing the end of the ileum, nor was there any band kinking the latter.

Dr. Nathan Mutch describes the histology of the growth as follows:—

"It consists of large, pale, irregularly polyhedral epithelial cells containing very fine granules. Under ⅙ in. objective they have an appearance resembling finely ground glass. Dividing these cells into irregular masses are more darkly stained elongated epithelial cells with long narrow nuclei. Many of these interlacing strands are made up of cells which have coalesced to form multicellular syncytial-like masses. The whole tumour is permeated by a rich vascular network. In many places blood has been extravasated, and the neighbouring tissues contain yellow granules of altered hæmoglobin. Some of the arteries are undergoing hyaline degeneration."

The case demonstrates very clearly the fact that obstruction at the duodeno-jejunal junction, which, according to the theory advanced by Sir W. Arbuthnot Lane, is usually produced by chronic intestinal stasis, and which was brought about here by the pressure of a tumour, may be directly responsible for the development of peptic ulceration.

Medical Societies.

TUBERCULOSIS SOCIETY.

A MEETING of this society was held at the Royal Society of Medicine on May 26th, Dr. HALLIDAY SUTHERLAND, the President, being in the chair, when Dr. R. C. WINGFIELD opened a discussion on

Tuberculosis in Relation to a Ministry of Health.

Dr. Wingfield said that experience in the conduct of the war had shown that only when the command was placed in the hands of one man had progress been made. This experience should be applied in tuberculosis. At present administration was divided up among so many authorities that in each area facilities for treatment varied considerably, from the progressive authority with every facility to the one which provided nothing. He did not think it was right that a patient should suffer handicap by living in a non-progressive area. In order to obtain unity of control it was not necessary that tuberculosis should be consigned to a watertight compartment, but a section in the Ministry should be set aside for tuberculosis under the leadership of one man. This man need not be a medical man, but he should be aided by a financial and a medical adviser, the latter having an advisory committee drawn from different branches of the work to keep him in touch with local conditions. Having obtained a single command the work in each area should be decentralised, each area being under the control of the tuberculosis officer, who would be responsible for the area to the Ministry of Health. He should receive all notifications and be assisted by health visitors, after-care workers, &c., responsible to him and have sanatorium, hospital, observation beds, and a laboratory under his control. Dr. Wingfield did not favour after-care committees, but thought that an after-care worker with assistance was more satisfactory. Sanatorium beds should be provided for 14 per cent. of the cases attending the dispensary and local homes provided for 2 per cent.—i.e., infectious cases which were too advanced for hospital and where the prognosis was hopeless. He favoured the creation of industrial colonies in each area, not necessarily in the country, where the work should be State subsidised and controlled by trade-union rates of wages. The farm colony was not suitable for the town dweller.

The Discussion.

Dr. HALLIDAY SUTHERLAND (Marylebone) thought that the local authority would have to be in control of the unit as they were responsible for the taxation to provide the funds. He considered that the colony system required further trial before any number were put up.

Mr. F. J. C. BLACKMORE (Woolwich) said that after-care committees should have funds to help the families of men undergoing sanatorium treatment. Lack of provision at present prevented many suitable cases from going into sanatorium.

Dr. F. R. WALTERS (Surrey) said that work in many sanatoriums was very indifferently done. As such work formed the basis of treatment it should be most carefully carried out to produce the best results.

Mr. H. DE CARLE WOODCOCK (Leeds) said that the tuberculosis officers should not be under the medical officer of health. There should be legislative power to remove infectious cases from populous areas. The after-care committee should form a vigilance society to compel the local authority to do its duty. He thought that the Pensions Ministry had gone far to solve the problem by providing for the families during the patient's absence in sanatorium

Dr. JAMES WATT (Downs Sanatorium) thought that to make each unit financially sound it must be under the control of the local authority; he did not see any reason why the tuberculosis officer and medical officer of health should not work together under the present system, and he thought the Ministry would keep to the present relations.

Dr. A. J. SHINNIE (Westminster) considered that the after-care committee in his area had been a failure, and advocated the appointment of a paid adviser for this work.

Dr. H. R. WILSON (Southwark) said that the tuberculosis officer and the medical officer of health should each be head of his own department, the tuberculosis officer being responsible to a subcommittee of the public health committee.

Dr. WINGFIELD briefly replied.

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND.

THE ordinary quarterly meeting of this association was held in the rooms of the Medical Society of London on May 20th, under the presidency of Dr. JOHN KEAY.

The Maudsley Lectureship.

The committee appointed to formulate conditions concerning this lectureship, arising out of the bequest of the late Dr. Maudsley, reported to the society the conditions determined upon. The lecturer is to receive a suitable honorarium and a gold medal and ribbon, and is to be elected by the council. The lecturer, who must have made contributions of well-recognised importance and value bearing on the knowledge of mind and its disorders, may be of any nationality or of either sex. The lecturer is required to give two lectures, one scientific, the other popular, the popular lecture dealing with the hygiene of mind.

Dr. C. F. F. MCDOWALL (Ticehurst House, Sussex) read a paper entitled

The Genesis of Delusions: Clinical Notes.

He said our social and political tendencies were the outcome of an analysis, more or less critical, and believed by the individual to be impartial. The reasoning was not always logical or the argument conclusive to people of other opinions, but the conclusion arrived at was final. Delusions and hallucinations did not arise accidentally; they had a definite basis, the foundation of which resided in the personal experience of the sufferer. It was the duty of the medical man to analyse the processes by which the abnormality had arisen and to work back to what might be termed the "taking-off point." A great step towards removing the difficulty was to gain the complete confidence of the patient. In men the underlying cause was often very quickly reached, but women were more reticent. The mere elucidation of the cause was not enough to effect a cure; the patient should be taught to follow, in their logical sequence, all the ideas which he had misinterpreted and misunderstood.

The Discussion.

Sir GEORGE SAVAGE said the condition under consideration he had long ago called "morbid mental growth." Some morbid mental growths he described as "innocent." A second form was that which modified utility, but still did not destroy; but the third, and more severe, kind invaded and destroyed faculties, such as when a person had delusions of persecution.

Dr. R. HUNTER STEEN emphasised, by the narration of a striking case, the fact that delusions were often in the form of wish-fulfilments.

Mr. J. CARSWELL (Glasgow) expressed his gratification that the younger men in the specialty were devoting themselves anew to clinical studies.

Dr. J. G. SOUTAR did not regard the method pursued by the author as psycho-analysis, but rather a simple investigation into the patient's life-history, which showed not only the genesis of the delusion, but also why it took that particular form. What was really needed was to know why a mind, previously sound, became, either suddenly or gradually, one suitable for the growth of hallucinations and delusions. He thought many delusions were reflexes of the patient's past failures, which only came into dominance later when he was in a less robust state. The re-education of the patient he considered to be of the greatest possible value.

Dr. MCDOWALL briefly replied.

Reviews and Notices of Books.

Clinical Microscopy and Chemistry. By F. A. MCJUNKIN, M.A., M.D., Professor of Pathology, Marquette University School of Medicine. With 131 illustrations. London: W. B. Saunders Company. 1919. Pp. 470. 16*s*.

FROM the point of view of the clinical pathologist this book is of great value. It is thoroughly up to date, comprehensive, and very well illustrated. There are sections on blood work, on sputum and body fluids, urinary and gastric tests, on the stools, on media-making, on histology, and on autopsy technique. Laboratory organisation, even down to card-index methods, finds a place. References and counter-references are apparently faultless, which is exceptional; in fact, omissions of any importance are pleasingly rare.

Amongst these, however, we note absence of the details of Dreyer's macroscopic agglutination method, although it is mentioned; also Fontana's method of staining spirochætes and the measurements of the blood cells are conspicuous by their absence. Bogg's method of determining the coagulation-time of blood, ingenious as it may be, does not supply a long-felt want—namely, an accurate method. It fails like all other coagulation-time tests in that it ignores the varying effects of viscosity and temperature. The technique of agglutination tests for transfusion cases is given, and the pages devoted to the chemical analysis of the body fluids are very full.

There are a number of tests hard to come by in most text-books of this sort, such as the cell-count for cerebro-spinal fluid and the antitrypsin content of blood test, which are detailed. Embedding tissues with soap for section is a process which can be found herein. The method of counting vaccines with a hæmocytometer, which Shera suggested in 1918, is also preferred to the conventional method of Wright. Howbeit, one hour does not seem to us to be long enough to allow for the bacilli to settle before counting. Tuberculin is not recommended. In Wassermann tests, Dr. McJunkin prefers a cholesterol antigen. This would seem to be the general view in America. In this country we think such an antigen too prone to give "false positive" reactions to be safe to use as a standard. Discriminating workers, however, find it most useful in determining the duration of treatment in known positive cases. "Partial positive" reactions in malaria, and so on, as detailed by the author, are more likely to be effects due to the vagaries of the cholesterol antigen than to bona-fide deviation.

Notwithstanding the minor defects of the book, which include the abuse of the word billion (which should mean a million times a million), we can thoroughly recommend it as the most concise and complete thesis of its kind extant.

The Physiological Feeding of Children. By ERIC PRITCHARD, M.A., M.D. Oxon., M.R.C.P. Lond., Physician to the Queen's Hospital for Children, &c. London: Henry Kimpton. 1919. Pp. 59. 3*s*. 6*d*. net.

THIS modest volume represents a chapter on the feeding of children over one year of age, written for the new and fourth edition of the author's "Physiological Feeding of Infants," shortly to be published. The language is simple and can be understood by the unlearned, which, as Dr. Pritchard points out, is not the case with the majority of standard works on dietaries. He advocates the feeding of children according to caloric requirement, basing the calculation upon age, weight, rate of growth, energy production, loss of heat, and certain other environmental conditions. The ratio or balance between the different constituents of food is also to be decided upon a physiological basis. Foodstuffs are then to be selected with a view to taste, digestibility, absorbability, physical qualities, and variety. Tables are given showing the caloric requirements of children at different ages, and on these are based a series of practical diet-sheets containing bills-of-fare for the three or four meals of the day, with the caloric value of each. In regard to the balance between the different constituents of food, Dr. Pritchard considers that the ratio of 1 : 5 between the protein and non-protein elements of the diet provided by nature for

the infant need not, in the case of children under 5, be modified up to the fifth year of age. The fat-carbohydrate ratio in breast-fed infants is 1 : 2; that for adults has been fixed by Voit at 1 : 10. As the child grows this ratio should gradually change, and Dr. Pritchard considers a ratio of 1 : 3·3 as suitable for a child of about 2 years, coming down to one of 1 : 5 or 1 : 6 for a child of 5 years. The author's common-sense view of foods and foodstuffs, and his persuasive method of approach, will induce many of his readers to think twice about caloric values. At the same time he lays stress on the value of appetite as an index of the body's requirements. A happy adjustment between caloric value and individual idiosyncrasy is what is wanted, and Dr. Pritchard is a safe guide to this adjustment.

JOURNALS.

American Review of Tuberculosis. Baltimore: National Association for the Study and Prevention of Tuberculosis. 35 cents.—The March number gives five original papers, the first of which, by Dr. A. K. Krause, deals with the career of a strain of human tubercle bacilli isolated by Dr. Trudeau as long ago as 1891. During the 10 years he has worked with this strain, the author has never noticed any variation in its virulence, which, we may add, is Ruppel's experience with the strain used at Hoechst in the manufacture of old tuberculin. He annotates his observations on experimental tracheo-bronchial node tuberculosis by somewhat speculative reasoning on the subject. In a paper on Influenza and Tuberculosis, Dr. H. J. Corper and Dr. E. D. Downing review the investigations they have made in a Government tuberculosis hospital during an epidemic of influenza. The authors found the influenza bacillus (Pfeiffer) in the nose and throat of 24 per cent. of consumptives without symptoms of influenza, and in 62 per cent. of consumptives with such symptoms. The corresponding incidence of this bacillus among non-tuberculous persons was 14 and 28·5 per cent. respectively. Their investigations also showed that the influenza bacillus can be carried for several weeks by persons without symptoms of the disease. In a paper on the results of tuberculin treatment Dr. B. H. Waters and Dr. A. Peters have analysed 1067 cases of pulmonary tuberculosis admitted to the Loomis Sanatorium between Dec. 15th, 1906, and Dec. 15th, 1912. The tuberculin generally employed was B.E., the initial dose was usually 0·000 0001 g., the maximum dose rarely exceeded 0·001 g., and the scheme of dosage was Brown's and Pope's. A comparison of the results of sanatorium treatment alone and with tuberculin did "not furnish any very impressive evidence of the value of tuberculin as a therapeutic agent in pulmonary tuberculosis."—Dr. C. L. Wheaton describes the system of tuberculosis control in a U.S.A. Army cantonment, and Dr. C. A. Wilson and Dr. R. G. Jones record a case of rupture of the mediastinum after induction of artificial pneumothorax. The patient survived this accident, the diagnosis of which appears to have been made as much by a process of excluding other diagnoses as by positive findings.

British Journal of Ophthalmology. September, 1918, to May, 1919.—This is now the sole journal published in Great Britain devoted to ophthalmology. Among the more important communications in recent numbers are the following:—

Dr. Gordon Holmes: Disturbances of Visual Orientation, a study of six cases of cerebral wounds in which, while visual acuity, visual fields, eye movements, and stereoscopic vision were all either entirely unaffected or only partially affected, the main symptom was a difficulty in fixing visible objects resulting in a failure of spatial orientation, so that the patient in walking collided with easily visible objects. An equal failure to converge on near objects, as in reading, was present, and in most of the patients there was an absence of the blinking reflex when large objects were suddenly brought close to their eyes. In all these cases the track of the projectile which caused the wound involved the neighbourhood of the angular gyrus, and it is suggested that the symptoms were due to injury of the centres in this gyrus, from which, as is known, movements of the eye can be elicited.

In the December number Sir George Berry, without contesting the theory that the angular gyrus may be involved in these cases, criticises the paper from the point of view of one who believes that the retinal rods are a specialised end organ having to do with the orientation and localisation of objects in space.

In the February number E. M. Eaton discusses Factors in Stereoscopic Vision and in the Visual Estimation of Distance, among which factors the faculty of binocular vision takes only a minor place. Nor do either the angular gyrus or the retinal rods enter into the question from his point of view at all, from which it will be seen that there is still much scope for speculation on these subjects.

In the November number there is an interesting article on the Treatment of Intra-ocular Foreign Bodies at a Base Hospital in France, by H. P. Gibb, F. A. Juler, and R. Foster Moore, from which we select an original observation to the effect that X ray localisation is unnecessary, as the position of the fragment may be quite accurately localised by finding the exact spot on the sclera at which the magnet causes most pain. This method, they say, is certainly more accurate than localisation by the X rays, "for the spot is noted directly on the globe, and, indeed, in two of our cases the foreign body has been so small that the X ray report was negative." The point is chiefly of importance in those cases where it is desirable to extract by a small magnet inserted through the sclera.

In the same number L. R. Yealland discusses Hysterical Disorders of Vision, the chief interest of his article being on the subject of hysterical limitation of the fields of vision. It is doubtful, he says, if these cases are really hysterical. They are certainly not organic. Further light is thrown on the subject in the January number by A. F. Hurst and J. L. M. Symns, who entirely agree with Babinski's view that the contracted and spiral fields supposed to be characteristic of hysteria are merely the results of suggestion. "We have examined numerous soldiers suffering from various war neuroses, who were abnormally suggestible as a result of the stress and strain of active service, some, but not all, of whom were suffering from gross hysterical symptoms, and we have never found any retraction of their field of vision until they were tested with the perimeter. But the perimeter invariably resulted in the suggestion of a narrowed field, however carefully it was used. Moreover, if the examination was continued after the first field was marked out, a spiral field was always obtained identical with that which has hitherto been regarded as a stigma of hysteria." Further, they found that if the white disc of the perimeter is moved outwards instead of inwards, as is commonly done, an *outward* spiral is always obtained. After this it is to be hoped that any diagnosis of contracted or spiral fields in a doubtful case may be suspended until the examination can be repeated and the field taken by more methods than one.

In the January number, also, Holmes Spicer publishes drawings illustrating various typical forms of change which corneal nebulæ are apt to undergo and which can be studied by means of the corneal loupe. To the same number Percy Dunn contributes a suggestive article on Thyroid Therapy in Ophthalmic Practice.

In the March number P. C. Bardsley describes a new form of bifocal lens for myopes, in which the reading portion is angled so as to get rid of the not inconsiderable cylindrical error that arises when any strong lens, either convex or concave, is not at right angles to the visual line. In the same number J. A. Pringle describes Three Cases of Gas Infection of the Cornea Following Gunshot Wounds of the Eyes. There are also reports on ophthalmic cases occurring in Malta in 1916–17 (September and October) by E. M. Maxwell, and ophthalmic cases in Egypt, 1915 (February number), by Sir J. W. Barrett; a discussion of the Pathology of a Rare Condition known as Ring Infiltration of the Cornea, by D. V. Giri (December number); and an account of an Operation for Intra-nasal Drainage of the Lacrymal Sac, by J. V. Paterson and J. S. Fraser (May number).

American Journal of Ophthalmology, October, 1918, to March, 1919.—At the beginning of 1918 the following journals were amalgamated under the above title: *The American Journal of Ophthalmology, The Ophthalmic Record, Annals of Ophthalmology, Anales de Oftalmologia, Ophthalmology, Ophthalmic Year-book and Literature.* Each monthly number of the amalgamated journal is made up of (1) original papers (from six to twelve); (2) short notes on instruments, cases, &c.; (3) reports of the meetings of the American Ophthalmological Society and other ophthalmological societies; (4) abstracts of selected papers from other journals; (5) editorials; (6) book notices; (7) correspondence, news items, &c.; and, finally, (8) a systematic digest of ophthalmic literature. From the original articles we select the following for comment:—

October, 1918.—F. H. Verhoeff: Observations on Parinaud's Conjunctivitis. Some new light is thrown on this rare disease. The theory that it is a form of tuberculosis is combated and its connexion with a minute leptothrix established. The organism is contained in the subepithelial foci of granulation tissue which are characteristic of the disease. The disease is almost always unilateral and more prevalent in winter. It is always associated with enlargement of the preauricular glands. Rex Duncan: Glioma of Retina, with Report of Three Cases Treated by Radium. The author advocates radium treatment of the stump of the optic nerve after enucleation in order to prevent recurrence. In early cases there is a good

prospect of success, and even in later and recurrent cases it should be employed. W. B. Weidler: Solid Œdema; Report of Three Cases. A persistent œdematous swelling of the whole or limited portions of the face, such as the eyelids or one of the lips, was described by Sir Jonathan Hutchinson as "solid œdema." In this paper the condition is well illustrated and attributed to a direct absorption of the toxins elaborated by the strepto- and staphylococci in the nasal mucosa. The treatment advocated is the injection of vaccines combined with local treatment of the nose.

November, 1918.—C. E. Ferree and G. Rand: The Inertia of Adjustment of the Eyes for Clear Seeing at Distances—a Study of Ocular Functions, with Special Reference to Aviation. Apparatus are described and the results of an experimental investigation recorded. The time required for 18 normal observers, all under 30, to pass from near to far vision varied between 0·50 and 1·16 seconds, from far to near between 0·39 and 0·82 seconds. It is suggested that such differences are constant for the individual and should be determined in the case of prospective aviators. E. Jackson: Permanent Vascular Changes Following Injuries to the Eye. A coloured plate with two interesting figures of very rare conditions are given. One shows complete obliteration of all the choroidal vessels and all the retinal vessels except one without any evidence of intra-ocular inflammation. The suggested explanation is injury to the vessels behind the eyeball, causing complete thrombosis. The second case is one of avulsion of the optic nerve and rupture of the choroid, presenting a picture (so far as the nerve, or rather absence of nerve, goes) comparable to a case recently reported by Colonel W. T. Lister at the last annual meeting of the Ophthalmological Society.

December, 1918.—This number contains an article by H. Friedenwald on Ophthalmoscopic Conditions Simulating Sarcoma of the Choroid, with plates illustrating the Pathology of these cases. Also one by F. P. Calhoun on Alterations in the Visual Fields associated with Pellagra. The report of a case of Transient Left Homonymous Hemianopia, by H. H. Tyson, has already been referred to in these columns.

January, 1919.—J. W. Downey: Determination of Minimum Light Sense and Retinal Dark Adaptation with Presentation of a New Type of Photometer. To obtain a stable standard of light is the chief desideratum in an instrument of this sort. A radio-active substance with the trade name of "marvelite," furnishing a source of light of constant value and low intensity, appears to serve the purpose well. It is sulphide of zinc impregnated with radium. After 12 months the luminosity of this substance attains a value which is sensibly constant.

February, 1919.—C. Weeker: Thermotherapy of Corneal Ulcers: a plea for the employment of heat without cauterisation in the treatment of spreading ulcer, illustrated by figures showing the non-destructive effects of the former as compared with the destructive effects of the latter on rabbits' eyes. F. A. Conlon: Bitemporal Hemianopsia due to Acute Suppuration of the Posterior Nasal Sinuses. The report of a rare case, the diagnosis being confirmed by partial recovery after operation. D. T. Vail: Monocular Retrobulbar Neuritis from Hyperplasia of the Ethmoid Bone. In this disease not only is the fundus oculi quite normal in the early stage, but the nasal cavity may also be normal to inspection, and yet the hyperplasia of one of the ethmoidal cells may so impinge on the optic canal as to compress the nerve and cause monocular blindness. The paper is a plea for early operation on the nasal cells, even when the retro-ocular neuritis is the only symptom, and cases of recovery are cited supporting this view. It would carry more weight if the proportion of cases of monocular retrobulbar neuritis which recover without operation were compared with the proportion of recoveries after operation, for spontaneous recovery does after all take place in the majority of cases. In the article by H. H. Turner on the Ætiology of Phlyctenular Ophthalmia we have again a low-grade chronic inflammation of the ethmoid cells suggested as the chief ætiological factor. Obstruction to drainage is the chief determining factor in the infection of the lymph channels of the orbit, and this obstruction may be due either to mechanical causes, such as enlarged tonsils, or to an increase in the viscidity of the mucus itself due to various forms of toxæmia, generally of intestinal origin. J. W. Jervey writes on Hyperplastic Exudative Retinitis (non-hæmorrhagic). This paper gives examples of the disease described by the late George Coats under the name "massive exudation of the retina."

March, 1919.—In this number we note a paper on Transplantation of Portions of Vertical Recti for Abducens Paralysis with successful result, and a note by G. S. Derby on Double Detachment of the Retina in Trench Nephritis. In this case a spontaneous recovery took place, but the case was not watched long enough to determine whether or not the recovery was permanent.

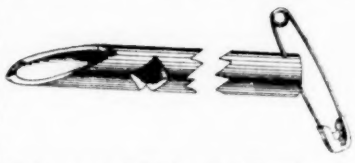
New Inventions.

ANÆSTHETICS: A NASAL AIR-WAY.

MANY of the troubles arising during the administration of an anæsthetic have their origin in some form of obstruction to the respiration. One cannot have at one's command too many alternative methods for overcoming this. For some years a plan I have adopted has been successful in many cases.

Description of Method.—The plan simply consists in making use of the nose for the passage of a tube into the naso-pharynx well behind the tongue. The value of this proceeding is, I believe, partly due to the fact that most patients, especially when under an anæsthetic, breathe, or endeavour to breathe, through the nose, and partly, also, to the action of the tube in pushing forward the soft palate and preventing the complete falling back of the base of the tongue.

The tube which I usually employ is an ordinary straight rubber drainage-tube of fairly firm texture and about 6 in. or 7 in. in length. It is better to have the tube too long than too short. As the depth of the naso-pharynx varies in different individuals it is not necessary to pass the tube the whole length in every case, but only far enough to ensure that a very appreciable current of air can be felt by the hand held over the orifice of the tube projecting from the nostril. The exact depth being thus determined, a safety-pin may be passed through one wall of the tube to prevent it slipping backwards. Experience proves that the tube should be as large as possible. For the average male adult this will be about 7/16 in. in diameter, for females about 5/16 in., and rather less for children. One end of the tube is bevelled off to an angle of about 45°, and a hole may be cut in the tube about an inch above and at right angles to the bevel (see figure). The bevel enables the tube to open up a passage past any slight obstruction and the second hole affords additional security. The newly cut edges should be smoothed off by means of a file or sand-paper. (A pattern tube has been deposited with Messrs. Mayer and Phelps, of 59, New Cavendish-street, W. 1.)



Method of Passing Tube.—Of almost more importance than the actual length and size of the tube is the method of passing it. After the patient has been anæsthetised the bevelled end of the tube is oiled or vaselined and is then inserted into the nostril of either side, almost at right angles to the face, and worked gently backwards; no force need be employed, and particularly, no upward direction should be given to the tube. If any slight obstruction be met with, this will often be overcome by twisting the tube round and so enabling the bevelled end to open out its own passage. If it should not do so, the other nostril should be tried. Occasionally, and especially on the first few attempts, a little bleeding from the nose may follow the passage of the tube, but this is of no real importance and soon stops. As one becomes more experienced, even this slight trouble becomes less frequent.

If, as a matter of curiosity, the finger be passed into the naso-pharynx after the tube has been inserted, it will be found that it is well behind the base of the tongue, which, in fact, often rests against it, and the openings of the tube are about on a level with or just above the glottis. Whatever troubles may now arise in connexion with the anæsthetic—e.g., spasm of the glottis—the free passage of air is ensured.

Indications for Use of Tube.—I do not pretend that the passage of this tube is either necessary or desirable in every case. For my own guidance I adopt the rule of only using it when I should otherwise be obliged to hold forward the jaw from the angles (a tedious proceeding for the anæsthetist and a painful one for the patient), as in commencing lividity or undue stertor.

Neither do I pretend that this plan ought entirely to supersede the use of the mouth prop or Hewitt's tube, or other methods of securing the same end—i.e., an open air-way—but many of those to whom I have demonstrated the method have been so struck with its simplicity and effectiveness that they have urged me to write a short note about it.

J. F. W. SILK, M.D. Lond.,
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THE LANCET.

LONDON: SATURDAY, JUNE 14, 1919.

The Ministry of Health: The Next Stage.

SOFTLY and silently, as in the quest for the snark, vanished away the opposition to the pooling of the principal official health agencies of the country in one central department, and ten days ago the Bill to establish a Ministry of Health for England and Wales and a Board of Health for Scotland, at one time the source of bitter dissension, received the Royal assent with such tacit approval that no comment was made upon it at the time in the columns of either the lay or the medical press. The passage of the Health Bill into a Health Act is but the beginning. The old buildings have been demolished. It remains to clear away the rubble and to build on the site a sound and lasting edifice. Towards this end two essential steps have already been taken by the Minister chiefly concerned. Dr. ADDISON has reserved for the service of the new Ministry two men and one woman of great departmental experience, each of whom has after high trial been found eminently successful in a bureau where medical and public interests closely interdigitate. Sir GEORGE NEWMAN, Sir ROBERT MORANT, and Dr. JANET CAMPBELL may be regarded as three well and truly laid foundation-stones of the new edifice. The second step is the promised consultation between Dr. ADDISON and his Medical Advisory Committee in regard to the drawing up of what we may call the architectural plan of the new building, which is likely to be embodied in a Medical Services Bill soon to be introduced.

It is a happy coincidence, possibly not altogether fortuitous, that at such a moment should appear a memorandum which can hardly fail to carry great weight with the Advisory Committee. This memorandum summarises discussions which took place at five conferences convened by the Insurance Commissioners and attended by a select number of the Insurance Acts Committee of the British Medical Association, along with six distinguished members chosen from their number by the Ministry of Health Committee of the English Royal Colleges and the Society of Medical Officers of Health. Sir NORMAN MOORE, Sir GEORGE MAKINS, Lady BARRETT, M.D., Sir BERTRAND DAWSON, Professor H. R. KENWOOD, and Sir BERKELEY MOYNIHAN were the nominees of this committee. The memorandum does something vastly more useful than drawing up a series of recommendations—it contains, in fact, no convenient summary at its conclusion; it gives an agreed and closely reasoned statement of the principles on which action should be taken, and as it has been issued to every practitioner in the country the general tenor of its contents may be regarded as familiar to the medical profession. Its most important topic is the provision of an expert out-patient service, such as was contemplated when the Insurance Act came into force in 1912, but which has suffered delay so distressful as to have largely imperilled the smooth working of the Act itself. The service is epitomised as an arrangement for the exchange of opinion and for coöperation in treatment between the general practitioner ordinarily attending a patient and the specialist to whom the patient is referred on occasion for advice or treatment. No rigid test of expert qualification is suggested in the memorandum, but rather that all those should be eligible who, by virtue of special academic or post-graduate study, by tenure of hospital and other appointments or by local recognition among colleagues as competent in a consultative capacity, naturally fall into the category. On a single point only—namely, whole-time appointment—does the memorandum approach anything like definiteness. The balance of professional opinion, it states, at the present time is adverse to the adoption of a system of "whole-timers" as being undesirable for the practitioner and not conducive to efficiency and prestige in the service.

One more general consideration. It lies at the root of any successful medical service that the practitioner of the future should find not merely expert help but that he should find himself, and it is with great pleasure that we publish this week in our correspondence columns a long, but none too long, letter from Dr. CHARLES FLEMMING, of Bradford-on-Avon, in which he tells us that the cry of the keen man has ever been "Give me opportunity," and that such an one scorns the suggestion made by certain would-be reformers to the effect that the general practitioner is not to rely too much on himself, but to learn to turn in all cases of difficulty to those whose life work it is to deal with that particular difficulty. To Dr. FLEMMING'S way of thinking, as to ours, that suggestion spells not the beginning of a new and successful era in general practice but the end of all reasonable treatment. What the general practitioner needs first and foremost is opportunity, whether in hospital or in clinic, of using his own powers of diagnosis and treatment. He requires abundant beds—Dr. FLEMMING suggests 3 or 4 per 1000 of population, and in so doing agrees with the estimate of a well-known Fabian inquiry—for cases which cannot in their own homes derive the best value from his knowledge and skill: for patients, that is to say, requiring careful observation for diagnosis, skilled nursing, dieting, massage, or other routine treatment, those needing psychotherapy and even those suffering from the results of over-fatigue. This granted, the adequate treatment of the beginnings of maladies will result, and there will be less opportunity for the development of small into major ailments requiring surgical and other specialist treatment. Dr. FLEMMING'S picture of the work of the general practitioner is strikingly poetical, and, we trust, prophetic. He has put into words thoughts which are not often so precisely expressed. And in that direction is another step to be taken by the Ministry of Health.

Bilharziasis: its Prevention and Treatment.

SCHISTOSOMIASIS is the name given to infections produced by a genus of trematode parasites individually known as *Schistosoma hæmatobium*, *S. mansoni*, and *S. japonicum*. Following LEIPER, the genus has been renamed after its discoverer, BILHARZ, the name of the disease becoming in accordance therewith bilharziosis or, preferably, bilharziasis.[1] *Bilharzia hæmatobia* and *B. mansoni* are very prevalent in Egypt, and have given rise to, and still give rise to, much invaliding and disease. Up till quite recently no treatment, preventive or curative, had given good results, and the unfortunate individual infected had to bear his troubles as best he could, with the help of what palliative drugs that medicine was able to put forward. But a better era is now dawning for the trematode host. In our present issue Dr. HAMILTON FAIRLEY gives an account of the recent researches that have been carried out in the disease as seen in Egypt. The work of Dr. R. T. LEIPER, Dr. J. G. THOMSON, and the late Dr. R. P. COCKIN on the intermediate molluscan hosts of the two species of bilharzia found in Egypt first made it possible to institute proper prophylactic measures to prevent the spread of the disease. Formerly we were quite in the dark as to the life-history of the trematode, and, therefore, could take no steps to stop its ravages. By a judicious campaign against molluscs, especially in a country like Egypt where the water-supplies are all under control, it is now quite within the bounds of possibility that the disease may be largely controlled, if not actually stamped out. The differentiation of *B. hæmatobia* from *B. mansoni* is also a first-class piece of work. The difference in the eggs of these two species might have made students pause and think why the same worm should produce dissimilar eggs, but authorities, even like LOOSS, were obsessed by the theory that the ova were produced by the same worm. LEIPER and his colleagues cleared up the mystery by a careful analysis of the life-history of the two worms. Dr. FAIRLEY, starting from this basis, has gone one stage further and has worked out the complement-fixation reaction in bilharziasis. He has produced an antigen from the livers of snails (*Planorbis boissyi*) infected with *S. mansoni*, utilising the method first described by BORDET and GENGOU, and he has been able to announce a positive fixation test for bilharziasis. The application of such a test as a control to cases treated by the new method will be invaluable.

Prevention, then, opens up an attractive prospect. In the meantime the treatment of cases of bilharziasis with intravenous injections of antimonium tartaratum (tartar emetic) is deservedly receiving attention. Such injections had been used with so great success in different forms of tropical disease (trypanosomiasis, leishmaniasis, ulcerating granuloma) that a trial of them for bilharzial diseases was certain to be forthcoming. Mr. J. E. R. MCDONAGH was the first to make the attempt, and claimed "great success."[2] This did not apparently give rise to much comment at the time, and, in fact, appears to have been unnoticed by Dr. J. B. CHRISTOPHERSON, who began in May, 1917, to treat vesical and rectal bilharziasis by this method[3] at the Khartoum Civil Hospital. From a supplementary paper by him in this issue of THE LANCET it will be seen that he claims very excellent results from such injections. Confirmation of these results has come[4] from Lieutenant-Colonel C. J. WILEY, A.A.M.C., in Egypt and more recently from Dr. G. C. LOW in London. The latter describes a case, treated at the London School of Tropical Medicine,[5] in which, just as in the cases described by CHRISTOPHERSON and WILEY, all the symptoms quickly disappeared after the injections of the tartar emetic, and ova could no longer be found. These cases will require following up to see that relapse does not take place, and it is here that the complement-fixation test will come in with such great value. If it can be relied on, then it will be possible to say if the patient is cured or not. This new treatment looks, then, as if it was the ideal after which workers in tropical medicine have been striving for generations—viz., a drug that will cure bilharzial disease. Assuming that further work bears out these initial successes—and private information has reached us of other cases that have also been successful—then a chronic, hitherto incurable disease, with all its attendant baleful consequences, will at last have come under the control of the physician, and the saving in life and suffering will be incalculable. As it is, the recent researches in bilharziasis form a page of which tropical workers may rightly be proud.

[1] H. B. DAY: THE LANCET, 1911, ii., 1329.

[2] The Biology and Treatment of Venereal Diseases. London: Harrison and Sons. 1915.

[3] THE LANCET, 1918, ii., 325.

[4] Brit. Med. Jour., 1918, ii., 716.

[5] Journ. of Trop. Med. and Hyg., May 15th, 1919.

Metropolitan Hospital Sunday Fund.

IT is now 50 years since THE LANCET first entered a plea for the formation of a Hospital Fund for London similar to that which had originated in Birmingham. In 1869 Dr. JAMES WAKLEY determined to devote himself to the task of making the Hospital Sunday movement national and, if possible, universal by causing it to become popular throughout the length and breadth of the land; though it was not until the year 1872 that he succeeded in arousing sufficient interest in the metropolis to launch his scheme successfully. In this connexion it is not without interest to quote from a letter which we received from the late Mr. BRUDENELL CARTER a short time before his death:—

"Here is a little bit of ancient history," he says. "When I joined THE LANCET staff in 1868 Dr. James Wakley was editor, and he was very anxious to obtain the establishment of Hospital Sunday. He caused several articles to be written on the subject by myself and others, and finally asked me whether I could not do something with the *Times*. I went to Delane on the subject, and he said that he was not prepared to commit the *Times* to the proposal, although he thought well of it, but that he would publish every extract from THE LANCET with regard to it that was

sent to him. We took full advantage of this, and THE LANCET, almost weekly, had a paragraph on the subject, all of them appearing also in the *Times*. About the same time I discussed the question with the Duke of Westminster, who was treasurer of St. George's and often there, and also with the Bishop of London, Dr. Jackson, whom I had known before his elevation to the bench. Both were at first opposed to it, the Duke thinking that the annual collection would withdraw subscriptions, the Bishop that the different religious bodies would never be got to combine. In due time all difficulties were overcome and a great meeting was held at the Mansion House for the establishment of the Fund. I went in before the chair was taken, while people were still standing about, and caught the Duke's eye, who beckoned to me. I went up to him and he pointed to the Bishop, who stood near, and said, 'Here, Carter, come and sit between two converts!' I was on the first council of the Fund."

The first collection was made on June 15th, 1873, when there were 1072 contributing congregations, and the total receipts for the year amounted to £27,000 8*s*. 1*d*. Last year the contributing congregations numbered 2194, and the total receipts amounted to £92,055 15*s*. 11*d*. Such progress as this has certainly justified Dr. WAKLEY'S faithful efforts. Great as has been its success in the past, there is need for more help of its kind in the future if the voluntary institutions of the metropolis are to fulfil their function in any adequate measure. When it is remembered that even before the war their financial burden was becoming greater than the hospitals could bear, and that coincidently with the growing demand for treatment there has been a gradual rise in the cost of living, labour, drugs, instruments, and materials, it requires no effort of imagination to realise the present need for help. Nor must it be forgotten that a vicious cycle of sickness and poverty will still further add to the burdens which the country will have to bear. If the whole truth were realised we feel sure that the response to the appeal on Hospital Sunday would be generous in the extreme, for the British peoples are ever generous in a worthy cause. Unfortunately, annual reports do not appeal to the heart in the same way as would actual personal observation of the work done; nor can the subscriber readily visualise the restoration of the mother to her home and the bread-winner to his family, which is the common service of our hospitals to the nation and to humanity.

Parthenogenesis in Vertebrates.

THE exhibition of a "fatherless frog" at the Royal Society's May conversazione[1] has attracted attention to the fact that in recent years it has been found possible to bring about development by artificial means in unfertilised eggs of at least one class of vertebrates—the amphibia. The work of J. LOEB in America and DELAGE in France at the end of the last and the beginning of the present century, followed up by numerous experiments by other workers, showed that in a number of invertebrates—echinoderms, worms, molluscs, and some insects—it was possible to produce parthenogenetic development by treatment by various chemical and physical means. The facts are indisputable, but there is as yet no complete agreement with regard to the nature of the stimulus which causes the eggs to develop. The opinion is gaining ground that the so-called parthenogenetic agents act by changing the condition of the surface of the egg and altering its permeability to electrolytes and to oxygen, but this aspect of the subject is very complex; those who are interested are referred to LOEB'S "Artificial Parthenogenesis and Fertilisation" (Chicago, 1913) and to BRACHET'S "L'œuf et les facteurs de l'ontogénèse" (Paris, 1917).

The first successful experiment on artificial parthenogenesis in a vertebrate was reported by GUYER, of Chicago, in 1907 (Science, vol. xxv.). He obtained tadpoles from frog's eggs by injecting the eggs with blood or lymph. BATAILLON went a step further and obtained tadpoles by pricking eggs which had been smeared with blood, whether of the frog or of a mammal or fish, and maintained that the introduction of leucocytes into the egg was a necessary factor for success. LOEB and BANCROFT, however, maintain that all that is required is a simple prick, and that development could be obtained without the introduction of any body-fluid or cells. They found that a maximum of 40 per cent. of the pricked eggs began to segment, and less than 1 per cent. produced tadpoles. Some of these, however, are recently reported to have undergone metamorphosis and to have attained an age at which the sex can be distinguished with certainty. In LOEB'S latest paper[2] he states that nine of his metamorphosed frogs have been dissected, and that seven of them were males and two females. This is a matter of considerable interest, for on the chromosome theory of sex determination it is to be expected a priori that all the parthenogenetic offspring should be of the same sex, unless the stimulus to development interferes in some way with the polar divisions of the egg nucleus. It is interesting to speculate whether the small percentage of eggs that develop is due to development being restricted to those eggs which are pricked at a particular stage of the polar divisions; so far as we know, this has not been investigated.

The question naturally presents itself, If parthenogenesis is possible in frogs, may it not be so also in mammals? Theoretically, there appears no reason against it, but in practice it would seem that the difficulties in the way of bringing it about will not easily be overcome. The mammalian ovum is not accessible either to chemical treatment or to such mechanical processes as pricking or shaking, and when one remembers the small percentage of viable parthenogenetic embryos that are obtained in most cases (the sea-urchin egg and a few others are exceptions to this), it seems highly improbable that mammalian ova will be caused to develop except by natural means. In view of the inconveniences which might arise if the means of performing the experiment successfully were discovered, it is perhaps to be hoped that the difficulties will remain insuperable.

[1] THE LANCET, June 7th, p. 994.

[2] Proc. Nat. Acad. Sci., iv., 1918, p. 60.

Annotations.

"Ne quid nimis."

THE VITAL STATISTICS OF 1917.

WHATEVER may be the constitution eventually assigned to the newly set up Ministry of Health it is manifestly important from a preventive viewpoint that opportunity should be taken to associate with that enterprise the admirably equipped statistical bureau at Somerset House which is now administered by the Registrar-General, and which, together with certain other departments of the Local Government Board, must form integral portions of the new ministerial territory. If, as we hope may happen, an arrangement of this kind should be adopted by those in authority, the Minister of Health would have ready to hand for reference the original series of statistical reports inaugurated in 1837 by Dr. William Farr. Representing as they do the progress of vital statistics from that year to the present, they supply the only safe basis for the study of problems relating to the public health. Figures are dangerous things unless handled by those who know how to use them. The Somerset House figures are free from known fallacies. On this account, if on no other, this unique series of 80 volumes will prove invaluable.

In a preface to his report for 1917 Sir Bernard Mallet frankly narrates the difficulties encountered by his department as the direct consequence of the war and how these difficulties have been overcome. He duly acknowledges the valuable services rendered by the medical officers of health throughout the country, and particularly their coöperation with him in the discharge of the additional duties imposed by recent Orders of the Local Government Board. The difficulty of estimating local populations, which always increases as the last Census enumeration becomes more remote, is still further accentuated by the unprecedented changes caused by the war amongst the living. Consequently the methods relied upon in normal times are now found to be worthless. Nevertheless, war conditions have brought to light many valuable sources of information not previously available, by which existing difficulties have to some extent been mitigated. The civilian populations of certain localities are derived from two independent sources: (1) the National Register, of which a count was made for this purpose at midsummer, 1917; and (2) the returns made under the scheme for the rationing of sugar. Although neither of these enumerations can be entirely satisfactory, the estimates for 1917 are believed to be superior to any otherwise obtainable. Throughout this report rates of mortality are based upon civilian deaths and civilian populations. This has been found necessary, not only because of the impossibility of ascertaining the average military population of each district in 1917, but because experience shows that in war-time transference to the area of previous residence is practically limited to civilian deaths alone. For the calculation of birth-rates, on the other hand, this method of statement is clearly inapplicable, because a large proportion of the year's births must be those of infants whose fathers were serving at the time in the Navy or Army. For this reason the population to which the births are related cannot exclude the military element. Nor can it be, as in peace-time, the number estimated to be actually present in the country at mid-year, for married men in the Services, who enjoy occasional home-leave, remain an effective element in the population so far as the birth-rate is concerned, even though spending most of their time abroad.

The local populations employed for birth-rate purposes, as well as the civilian populations used for death-rates, have regularly been furnished from the central office to the several medical officers concerned. The values have been obtained by increasing the local civilian population estimate to the extent by which the birth-rate population of the whole country exceeds the civilian population. The birth-rate figures for 1917 merit close attention. The births registered numbered 668,346, or 117,174 fewer than in the previous year, during which 93,576 fewer births had been recorded than in 1914, a year which may be regarded as the last unaffected by war conditions. The birth-rate was 17·8 per 1000 living and was the lowest on record. The total fall in 1917 as compared with 1914 was 6·0 per 1000, or just over 25 per cent. of the number of births. Even this large reduction, however, is believed to compare favourably with the experience of the Central Empires and of other belligerent countries. Moreover, it need not alarm us if, as Mr. Harold Cox avers, a decrease in the quantity of children born augurs an improvement in the quality of their upbringing. Of the 668,346 births recorded 37,157 were those of illegitmate children—a decrease of 532 from the number in the preceding year, when the total number of births was greater by 117,174. The illegitimate births have thus declined by 1·4 per cent. Calculated by the conventional method in terms of total births it might wrongly appear that there has been no decrease in illegitimacy during the last 40 years; whereas, taken in proportion to the unmarried and widowed female population of child-bearing ages it is found that the rate of illegitimacy has never been so low as it is at present. This is a reply, and one which cannot be challenged, to those funny persons who, in the cause of morality, were never tired of assuming general promiscuity amongst our young men and maidens throughout the war. The natural increase of the population in any given year is, of course, equal to the births minus the deaths. In 1917 the excess of births over deaths in England and Wales was 169,424, against 277,303 in 1916, and 362,354 in 1914. The decrease in births of 117,174 from those in 1916 was only offset to a slight degree by a decrease of 9295 in the deaths. The death-rate also of 1917 was not ominous; though hideously higher than it would have been if the great changes hoped for under a Ministry of Health had come into being, it remains a tribute of good work to a sorely pressed medical profession. A remarkable feature of the year is the extraordinarily low death-rates of children under five years, which are much below any previously recorded, being, indeed, only about half of those prevalent in the concluding years of last century. This is not entirely due to decline of mortality, as the alteration in the character of the population aged 0–5 years due to fall in the birth-rate has contributed to it. The proportion of young infants in this population is now much below normal, and it continues to decline with the fall in the birth-rate. On the other hand, there was in 1917 a further increase in the abnormally high death-rate of civilian males of military age, consequent on the withdrawal of the more healthy men by enlistment. There was also

an excess of mortality among the aged, although not so marked as in the two preceding years. Infant mortality was equal to 96 per 1000 births in the year under notice, and was one of the three lowest rates hitherto recorded. The rate was 5 per 1000 above that of the previous year, but 13 below the average of the 10 years 1907–16. Owing to the rapid fall in the birth-rate the conventional statement of infant mortality somewhat exaggerates its record in 1917, and when allowance is made for this the excess over 1916 almost entirely disappears. Here again is a lesson for the scaremongers. Those who at first sight of these returns feverishly proclaimed the rising tide of industrial infanticide will now observe that their ululations were almost, if not altogether, vain.

THE INVESTIGATION OF ATMOSPHERIC POLLUTION.

WE publish this week in a Special Supplement the Fourth Report of the Committee for the Investigation of Atmospheric Pollution, the observations recorded being those made from April, 1917, to March, 1918, inclusive. For economic reasons the Committee have not repeated in this report the full lists in detail of the figures of monthly deposit from various stations, these having already been published in consecutive issues of THE LANCET through the experimental year. The number of observing stations has not fallen off; the report deals with 24 of them, and it is hoped that on the resumption of peace conditions further stations will renew their work and others be added. Considering the results as a whole there is some indication of an improvement in the state of the atmosphere during the winter months, the degree of pollution during the summer months being on the increase. The same tendency was seen in the 1916–17 records, as compared with those of 1915–16, and may be put in relation with the active operations of aerial warfare. Careful analyses are given as to the nature and kind of the constituents of the deposit, considerable variations being shown in the relative amounts of insoluble matter (carbon, tar, and ash) and soluble matter (ammonia, sulphates, chlorides). An interesting development, mainly the result of Dr. Owens's researches, has occurred during the year, and may lead to a greater insight into the actual suspended impurity in the atmosphere as distinct from the deposit collected with the rain-water in the standard gauges. This work is fully described in the report. Hitherto Dr. Owens had used a single-record filter, permitting an observation to be taken in about 10 or 15 minutes, but with the objections (*a*) that it was not automatic or continuous, and (*b*) did not take account of various coloured deposits. He has now constructed an ingenious filter, which operates automatically and gives records at short intervals over a period of 12 or 24 hours on a clock-face-like disc of paper. The result indicates the actual condition of the air, as regards suspended impurity, which reaches and damages the human breathing machinery. The filter, in fact, mirrors what may be taken to be happening on respiratory tissue in polluted and unpolluted conditions of the air. The Committee may be congratulated on the good work it has already organised and achieved. Much still remains to be done, but the outcome of patient research work must, we feel sure, be an appreciation at its true value of the mischief done by evil methods of fuel consumption.

SANATORIUMS FOR SOLDIERS AND SAILORS.

THE need for the provision of adequate accommodation for discharged soldiers and sailors suffering from consumption has been exercising the minds of the authorities concerned for some time, and not without reason. A memorandum of the Local Government Board, issued in October last, stated that "Mr. Hayes Fisher is satisfied that a substantial addition to the existing accommodation for the more advanced cases is required at once." At that time county and borough councils were asked to ascertain whether some of their existing buildings could be utilised for residential accommodation, and it was suggested that use might be made temporarily of fever blocks, small-pox hospitals, or suitable Poor-law accommodation, or, failing this, that suitable premises should be leased and used for the treatment of tuberculosis, in order to save the expense which would be incurred in alterations. At a recent meeting of the Essex Insurance Committee one of the members stated that "although there were few persons awaiting admission to institutions, many were now being treated in their homes who really required hospital treatment, while such treatment could not be granted owing to lack of suitable accommodation." The following statement has now been issued by the Local Government Board:—

> The Inter-Departmental Committee on Tuberculosis amongst Discharged Soldiers and Sailors, comprising representatives from the Local Government Boards for England, Scotland, and Ireland, the National Health Insurance Commissions for England and Ireland, the Board of Agriculture, the Ministry of Labour and the Ministry of Pensions, together with Dr. Nathan Raw, M.P., Sir Owen Thomas, M.P., and Sir Kingsley Wood, M.P., and presided over by Sir Montague Barlow, has held nine meetings and has heard a large amount of evidence from Government departments, local authorities, directors of sanatoriums and of colonies for disabled men, and from soldiers' organisations. The Committee have begun considering their report and hope, soon after Parliament reassembles, to publish their recommendations with a view to prompt steps being taken to secure adequate solution of this urgent problem and full provision of treatment for all tuberculous discharged soldiers and sailors.

This "adequate solution" is overdue and we hope that suitable accommodation will be provided without delay. The utilisation of huts which have been used as hospitals during the war and are now being put on the market should help.

INTRACARDIAL INJECTION.

IN the course of the last 12 years von den Velden[1] has employed intracardial injections of circulatory stimulants such as strophanthin, digifolin, digipuratum, camphor oil, caffein, or suprarenal preparations in cases in which the drug could not be introduced into the circulation in any other way, and when even injection into the jugular vein failed. The injection was made in the fourth or fifth intercostal space about two fingers'-breadth from the left border of the sternum so as to avoid the internal mammary artery, and usually the right ventricle, or in a few cases the right auricle, was reached. The injection site naturally varied with the conformation of the thorax, the position of the diaphragm, the form and size of the heart, and other circumstances. A Record cannula was used twice to three times the ordinary length, but of the usual diameter. It was sufficient to pass it

[1] Münchn. med. Wchnshr., 1919, lxvi., 274–75.

into the myocardium, and in no case was the actual cavity of the ventricle reached, the stimulus of the puncture of the epicardium or heart muscle being doubtless sufficient to cause an immediate contraction of the heart. In about one-third of the cases the success of the injection was surprising. The pulse, which up till then had been no longer or only barely perceptible, became strong, the heart sounds, which had previously been almost inaudible, became vigorous, and consciousness returned. In two-thirds of the cases no effect was produced. The time of the injection, the character of the drug, and especially the cause of the cardiac failure, were of great importance. No success was obtained in heart failure due to gas poisoning or infectious diseases (enteric fever, influenza, septicæmia), and good results only occurred in cases of "heart disease"—i.e., various forms of myocardial affection with or without valvular involvement. It was never possible to keep the circulation going for more than eight hours by means of intracardial injection. All the cases died, and a second injection which was made in four cases had no effect.

DISINTERESTED PRESCRIPTIONS.

THERE will be found in our correspondence columns a letter which raises the question as to whether medical men should become privileged shareholders in a concern for the manufacture of proprietary remedies. This question, though one proper to be raised, is hardly presented by our correspondent with sufficient detail in respect of the specific instance that has provoked it. It is not probable, nor is it desirable, that the General Medical Council should adopt any procedure restrictive of individual liberty of action without clear evidence that the public interests would be thereby promoted. Whether the holding of shares in such a concern can be considered unethical or unworthy will depend upon a great many different circumstances. In this case the apprehensions existing in our correspondent's mind appear to have arisen in consequence of the restricted nature of the issue, of which one result would appear to be that control or direction would pass largely into the hands of three classes of persons who might be thought to be specially interested in promoting the sale of the articles manufactured. The nature of the articles to be manufactured is not stated; but it might well be that it was really in the public interest for the manufacture and distribution of certain articles to be largely controlled by medical men, although not necessarily such as are engaged in clinical practice. The danger that seems to loom in our correspondent's mind is that, as practitioners became personally interested in the affairs of a particular manufacturing company, members of the public would be in danger of having foisted upon them, as a result of conscious, or more probably of unconscious, bias, prescriptions which would be no more than second best. This possibility is not one lightly to be dismissed, for in certain circumstances the danger might be real; but, so far as is at present made clear—without more knowledge of the circular to which reference is made than is stated in the letter—it would seem that the matter is one for personal judgment rather than for the jurisdiction of the General Medical Council, and we are confident that no widespread deviation from the line of conduct befitting our profession will arise to make official action necessary. It would be no easy task to frame provisions—of which the transgression would necessarily involve high penalty—that would affect our correspondent's laudable desire and yet would not give rise to many "hard cases" or, indeed, even positive injustices.

THE CLOSE OF THE SEASON AT THE ROYAL SOCIETY OF MEDICINE.

THE President and secretaries of the Royal Society of Medicine were rightly congratulated last week on the success of their Wednesday social evenings. It was particularly fitting that the vote of thanks to them for their energy and devotion should have been moved by an officer of the United States Army and seconded by a "visitor" from the Dominions. For it is to the keen sense of appreciation shown by the society's guests as well as to the splendid hospitality of its officers that the congenial atmosphere of these gatherings has been due. Mr. C. H. Fagge gave some ground for hoping that there is a second series in embryo, but for the present, at all events, the interesting lecture by Mr. Cairns Forsyth is the end. Mr. Forsyth related his experiences with an urgency cases hospital on the Argonne-Verdun front. His descriptions of the wounded "poilu" and of the French officers with their *esprit de famille* revealed a deep and sympathetic understanding of national character. As médecin-chef, first at Bar-le-Duc and then in the homely little hospital at Faux Miroir, put together by the Friends' Mission, he was not only surgeon but also apostle of the entente. The discourse was well illustrated on the screen, and, as on other occasions, was followed by the display of a remarkable kinema film featuring the successful inoculation of a rabbit with the pale spirochæte and its subsequent treatment with salvarsan. The section showing movement of the spirochætes as seen through the ultra-microscope with dark-ground illumination was a revelation in pictorial skill. A single injection of salvarsan caused their disappearance, and the rabbit was last seen serenely nibbling a lettuce-leaf.

PERSISTENT PIGMENTATION DUE TO ANTIPYRIN.

ANTIPYRIN may produce various eruptions—erythematous, purpuric, vesicular, or bullous. Sometimes pigmentation follows. In the *Medical Journal of Australia* Mr. Norman Paul has reported the following remarkable case of pigmentation, which gave rise to difficulty in diagnosis because of its persistence. A strong healthy man, aged 32 years, consulted numerous practitioners for an eruption. Being uncertain of the diagnosis, they usually fell back on the possibility of syphilis, but the blood, tested on several occasions, always gave a negative Wassermann. When he came under the author's observation the eruption had existed for four or five years, but the patient was unable himself to suggest any causative factor. Asked, however, as to whether he had taken any medicine, the fact came to light that he had taken some headache powders (antipyrin) the previous evening. This recalled to his mind the fact that the eruption first followed taking a headache powder and was associated with pruritus so severe that the skin was excoriated by rubbing. He could not then tolerate his clothes on account of the tenderness. On examination the lesions were isolated, sharply defined, plaques; the

recent ones were erythematous, circular, well-defined, and slightly elevated, and appeared mainly on the extensor surfaces of the arms in the vicinity of the elbows and on the buttocks. They were itchy, and for the most part of the size of a shilling or a sixpence. The older lesions were flat and circular and varied in size, the majority being about the size of a florin. They were divided into two zones, an external of a dark purplish or violaceous colour with a central whitish area suggestive of atrophy. Other lesions showed the outer zone to be slatish brown with a similar white centre, not unlike the lesions sometimes seen in macular leprosy. On the anterior surface of the body there were only two lesions, one above the umbilicus, the other, of irregular shape, affecting the greater part of the penis and showing a dark purple or blackish tinge without any central whitish area. When antipyrin was taken these old lesions became itchy within an hour. Brocq and Darier have reported cases of persistent erythema accompanied by pigmentation due to antipyrin. Fournier described pigmentation of the penis following an erythematous eruption produced by antipyrin. Ehrmann observed macular pigmented lesions on the penis and scrotum which recurred from time to time, usually after taking antipyrin. Mr. Paul suggests that the pigmentation in his case was due to the severe rubbing and excoriation of the lesions, as others not so severely handled by the patient disappeared without leaving pigmentation.

THE NEW BATH.

RECENT years have given great opportunities to our watering-places and health resorts to develop and make interesting and scientific their regime of treatment. Balneological practice has advanced considerably, at all events at Bath, where the city authorities have placed at the disposal of the War Office and the Admiralty their great bathing establishment for the free treatment of wounded or invalided officers and men selected for the purpose. The result has been that many thousands of applications have been given with large benefit and without cost either to the Government or to the patients themselves, and the relief afforded in so many of the cases has been widely appreciated. It has been a difficult time in which to carry out any work of extension, but, owing to the increased demand for the mineral-water treatment, the city authorities decided to get a scheme prepared for the provision of additional accommodation. Sanction for carrying out the scheme was obtained during the war and this important work was begun. The extension was completed recently and, on the invitation of the corporation, Dr. Addison was present at the opening ceremony, which was held on Thursday, June 5th. In declaring the new bath installation open, Dr. Addison said it so happened that the Act of Parliament establishing a Ministry of Public Health had received the Royal assent two days previously, so that this ceremony was probably the last occasion on which a President of the Local Government Board would make speeches, and that marked the period, he supposed, when the first Minister of Public Health commenced work. It might well be in the time to come, he added, that as local health services were developed the Ministry of Health would look to the corporation of Bath to make available for the services of the country the unique advantages which Bath enjoyed. The enterprise inaugurated that day made him certain that the Ministry would not look in vain to the Bath Corporation for assistance and support. He congratulated them on preserving the architectural features of the city, and concluded by expressing the hope that the same types of architecture (the celebrated Georgian façades and design) would be carried into their housing schemes.

The new bath equipment bears ample evidence of the authorities' determination to provide the essentials of advanced hydro-therapeutic practice at this important health station and to make English practice comparable for thoroughness and energy with that which is carried on abroad. The new wing includes the up-to-date appliances for treatment by Plombières douches, Aix and Vichy massage, massage under the mineral water, whirlpool, and aeration baths, as well as electric hot-air, radiant heat, and light treatment, and a well-organised department for mechano-therapy. There seems little doubt that the remarkable radio-activity of Bath water adds considerably to the value of these methods of administration. Formerly the waters were used empirically, since chemical analysis was at a loss to explain their therapeutic action, and according to the report of THE LANCET Commission in October, 1899, the waters presented no ingredient out of the common compared with that of ordinary drinking supplies. Lime salts were the chief constituents. Then came Sir James Dewar's discovery of argon and helium in the gases evolved, which did not appear to have any therapeutic importance until the later researches of Sir William Ramsay showed that a radium emanation was given off, to which he gave the name of niton. So marked was the output of niton that Sir William Ramsay found his entrance into the laboratory after a bath in the waters put his apparatus out of gear; the distended gold leaves of the electroscope collapsed from the ionisation of the air, and could not be separated by a fresh electric charge so long as he was present. Bath possesses a valuable asset in its thermal waters and the city authorities are well advised to carry on developments uniformly with the pace of therapeutic advances.

DR. JULES REGNAULT ON ANÆSTHETICS.[1]

THE preference for local rather than general anæsthetics, which is more common on the continent than either in Great Britain or in America, is the most striking feature of a brochure from the pen of M. Jules Regnault. That the author's experiences have been very largely with French naval forces may partly account for the preference in this case. The typical sailor is not an easy subject for general anæsthesia. However, we believe the main reason to be that our continental confrères have been more concerned with finding a way to render operation convenient for themselves rather than with developing a body of men whose duty it shall be to effect this for them. Specialists in anæsthetics are rare abroad, and consequently the surgeon often finds that an efficient analgesia produced by his own hands is to be preferred to the administration of a general anæsthetic by a man of small experience. M. Regnault maintains that on general grounds the more often patients who have to undergo operation can be spared a general anæsthetic the better.

[1] Archives de Médecine et Pharmacie Navales, March, 1919.

This is a very debatable point. Most persons are better protected from harm, we imagine, if they are unconscious while they are being operated upon. Most surgeons, too, are hampered by knowledge of the consciousness of the patient on whom they are at work. M. Regnault, after a brief survey of the history of anæsthetics generally, gives an interesting account of the origin and development of local anæsthesia, laying stress on the pioneer work of Reclus and other French surgeons. When a general anæsthetic has to be used the author employs for choice a mixture of ethyl chloride (25 per cent.) with chloroform (75 per cent.). He alludes to the work of Finnemore and Wade, in which the importance of the presence of small quantities of ethyl chloride in ordinary chloroform was first described. The chloroform mixture is given on a pad, with some air limitation at the beginning of induction. It is stated that by inserting wads of cotton-wool into the nostrils this mixture can be used for obtaining a rapid analgesia without loss of consciousness. The whole paper gives a valuable conspectus of French practice and is of more than passing interest.

POPULATION FIGURES AND THE WAR.

Hans Guradze[1] gives a review of population statistics, mainly in Germany, during the war years. As for the gross result, the comparative total German population in August, 1914, and at the end of 1918, he is inclined to make his estimate midway between that of Prinzing (a deficit of 4 millions) and that of Kucynski, who, writing, however, at the end of 1916, made the gains by birth balance the losses by death. He puts the diminution at about 2 millions—viz., from 67·8 to about 65·5 millions. The mortality of the civil population showed no increase in the first five months of the war, but in the next two years it rose 12 per cent. Its further course evinced the progressively fatal effects of the blockade, which, by Hamel's reckoning had, up to the end of 1918, 763,000 victims, exclusive of influenza deaths, so that "we must almost regret not having done the same in 1871." In 1917 civilian deaths were 32 per cent. over the 1913 figures, and in 1918 37 per cent. Altogether in the war years (to the end of 1918) 5,400,000 civilians died. To these have to be added about 1,600,000 combatants perished, giving a total mortality of 7,000,000. The births during the same period can be put at 5,000,000, seeing that 3·3 millions had been registered up to the end of 1916. So that the net decline in population comes, as already said, to some 2,000,000. The seasonal distribution of births was altered latterly. Usual maximum months are February and March, but in 1916 and 1917 September showed the most. This may probably be attributed to the Christmas leave of the troops in 1915 and 1916. Diminution of births from the absence abroad of husbands is one of the disadvantages of fighting a war on enemy soil. The author agrees in the main with Kucynski in putting the case thus, that in the first 40 war months (up to Dec. 31st, 1917) 2,000,000 less children were born than in the preceding 40 peace months. Births in Berlin fell by half, from 40,833 to 20,178; in 1918 the proportion of first-born births increased, perhaps indicating increased prevalence of artificial family restriction; there was also a greater proportion of male births. In Berlin, too, marriages decreased from 21,000 in 1913 to 16,000 in 1918. International statistics were only available to the author up to 1915, but he comments on the fact that an even greater drop in marriages occurred in Italy, while in Great Britain, however, marriages increased in 1915, which he attributes to conscription being made to apply to bachelors. Finland likewise showed a decrease in marriages. All countries, however, without exception, had fewer children born. This fact makes the gross infantile mortality seem less than it is. After the war in Germany women will be in a 10 per cent., and women of child-bearing age in a 15 per cent., excess. Besides the above quantitative aspect of war losses, qualitatively bodily and mental weakening of the survivors has to be reckoned with. The author concludes by noticing an estimate that the war has cost Europe, in dead and disabled, from 25 to 30 million human beings, and that thereby the value of labour will be raised by any figure from 25 to 100 per cent. His prophecy recalls the economic and political results of the Black Death in the early history of this country.

[1] Zeitschrift für Sexualwissenschaft, April, 1919.

THE CHRONICITY OF DYSENTERY INFECTION.

A VALUABLE and interesting contribution to the study of chronicity in dysentery carriers is provided by Captain W. Fletcher, R.A.M.C., and Dr. Doris Mackinnon in their report recently published by the Medical Research Committee. The important points detailed and carefully elucidated by the authors call for close attention on the part of public health bodies in dealing with the difficulties of the many-sided problem of the disposal of carriers. The subject of the chronicity of infection by *E. histolytica* has already been brought forward through papers published by well-known protozoologists, and receives further confirmation in the contribution under review, cases being quoted, the origin of whose infection is held to date back 15 or 20 years. More particular study, however, has been devoted by Captain Fletcher and Dr. Mackinnon to the hitherto little recognised duration of the bacillary form of dysentery. The term "chronic" is applied to cases whose history is marked by diarrhœa and the passage of blood from time to time in the intervals between acute manifestations of dysentery and whose course is liable to frequent breakdown through recurrence. Stress is laid on the pitiable condition to which periodic relapse may reduce victims of the disease, how futile are the efforts permanently to cure such cases, at the best amounting to little more than temporary improvement by care, rest, and dieting to procure a condition of fitness for light duties only. That these men are unfit for active service and are to be regarded "lost as active soldiers" is indisputable. The importance of those constituting the medical boards making inquiry into past histories of dysentery cases is strongly emphasised, for without this evidence there can be no guarantee as to the future prospect of recurrence. To pass such men as fit for active service can only result in inevitable relapse and much personal suffering in nine out of ten cases, in addition to proving economically disastrous by the loss of time, expense, and labour involved in frequent transfer of sick from front to base. Similarly, too, the evidence of past history, if elicited by the medical boards deciding the question of claim for pension, must be seriously weighed and considered in the

light of the striking facts disclosed by the authors. Careful inquiry into the histories of nearly all those found to be carriers of dysentery bacilli or *E. histolytica* during the course of the examination of 1782 convalescents at the University War Hospital, Southampton, resulted in the collection of records of 74 bacillary carriers and of 122 carriers of *E. histolytica*. Further, the histories of 42 convalescents whose examinations proved negative yielded a proportion of "chronics" closely similar to that obtaining among those with "positive" examinations. In the group of "persistent carriers" of *B. dysenteriæ* are included all those who remained carriers for longer than three months after the onset of illness. 20 per cent. of the convalescents passing Flexner's bacillus and all those from whom Shiga's bacillus was obtained fall into this category.

As the result of much laborious and detailed bacteriological investigation Captain Fletcher and Dr. Mackinnon have succeeded in establishing the recognition of important definite features which both clinically and bacteriologically characterise and distinguish the varieties of Flexner and Shiga dysentery. The clinical differentiation of the two groups has hitherto been but little if at all realised, and may therefore be quoted verbatim:—

> "The average Flexner carrier is in good health; his stools are formed and free from blood and mucus if his intestine has not been damaged by inflammation due to amœbæ or some other cause. He is fit to carry on his work unless he is subjected to very adverse conditions of feeding, temperature, or labour which may induce attacks of diarrhœa. The Shiga carrier, on the other hand, is generally an invalid; his stools usually contain blood and mucus, and he has frequent attacks of diarrhœa; but this is not all, for in addition to his bodily ailments he often becomes a mental wreck. The weakening effect of the constant diarrhœa, the straining and tenesmus, the dragging sensation in the abdomen, the concentration of the attention upon the presence or absence of blood and slime in the stools, and the frequent disappointment, due to repeated relapses, tell upon the patient's mind and reduce his mental state to one of misery and dejection."

So pitiable and melancholy a picture of the plight of the chronic Shiga carrier can but afford convincing argument that few, if any, of these patients will ever again be fit for a really active life. Infections with Shiga's bacillus are liable to a chronicity lasting months, even years, defying every effort at cure, and are marked by a proneness to relapse at any departure from a quiet, semi-invalid life or plain light diet, and, lastly, by evidence that the disease was originally contracted in the East. In these respects this type of bacillary dysentery, it is pointed out, bears close resemblance to amœbic dysentery, but the important difference is observed that whereas healthy carriers of *E. histolytica* are very common, healthy Shiga carriers are very rare. Evidence of low immunity against infection by the Shiga bacillus is proved by the results of agglutination tests, in none of which did the serum of 13 persistent carriers contain a large quantity of agglutinins—a probable explanation of the rarity of healthy carriers of this organism. Cases are quoted giving an estimated duration of infection over periods varying from two to ten years, and showing by repeated bacteriological examination the uniform persistence of Shiga's bacillus in the carriers' stools. The course of infection by organisms of the Flexner group yields a somewhat striking contrast to that of Shiga's bacillus in the marked intermittency with which the former appear in the stools and without relation to a recrudescence of symptoms, Flexner bacilli being found only for one or two days in succession and followed by a clear period of four of five weeks. Shiga's bacillus was identified once in about every two specimens and the Flexner group once in about every five specimens of the examined carriers stools. Further, Flexner patients showed a far higher immunity by the measure of agglutinins. The two types also appear to have a different geographical distribution, the Shiga variety being more confined to tropical and subtropical regions and rare on the Western front, whereas Flexner dysentery has a much more general range. The important features of Flexner infection demand special attention, in that its intermittency, the comparatively good state of health of the individual, and the normal appearance of the stools render the carrier a dangerous source of the spread of the disease by reason of his freedom to mix with his fellow-men and the greater likelihood of his escaping detection and by the difficulty of saying when he has ceased to be a carrier.

Captain Fletcher and Dr. Mackinnon are to be congratulated upon the thorough and able series of investigations and observations embodied in their paper. Not least among certain important recommendations made are that the examination of dysentery convalescents should be carried out in laboratories attached to the hospitals where the patients are treated, to enable the laboratory worker to deal directly with the patient, and that the medical officer in clinical charge of the patients should work under the direction of the officer in charge of the laboratory. Chronic Flexner carriers should be employed for six months in England in light occupations other than those concerned in the handling of food, then sent to hospital for two weeks, during which their stools should be examined at least six times. Chronic Shiga carriers should, after discharge from the Army, be placed under the supervision of the civil health authority. A wise suggestion is advanced that a permanent depôt be established for those chronic cases which have been in hospital for long periods without material benefit despite all efforts at treatment and dieting. It is certain that there will be a residuum of patients remaining more or less permanently incurable who, whether carriers or not, are unfit for return into the civil population. It is therefore much to be hoped that Government action may take form in the provision of a permanent depôt or institution on the lines of a "colony," complete in itself, in which the necessary treatment and suitable occupation will be forthcoming for these unfit and unfortunate victims of the great war.

WHOM THE KING DELIGHTETH TO HONOUR.

THE memory of duty well done through years of great stress and danger will compensate many medical men and women for the absence—we might even add, for the presence—of their names in the list of Birthday Honours. Not that the list is a short one. It is, in point of fact, the longest list of honours ever granted at one time to the medical profession, and is gratifying evidence of the increasing recognition by those in authority of the value of medicine to the State. Elsewhere in our columns will be found the full text setting forth at length the names, in so far as they did not appear last week, of those whose services have won special recognition. Where desert is so general it would be invidious to single out particular names, but we cannot refrain from welcoming the award of the C.V.O. to Dr. J. Mitchell Bruce

and to Sir Alexander Houston, who have in different ways contributed so greatly to medical literature. Knighthoods of the British Empire fall to two famous pathologists, Professor G. Sims Woodhead and Professor F. W. Mott, as well as to Mr. D'Arcy Power and Mr. Charters J. Symonds. Mr. W. T. Lister and Mr. Cuthbert S. Wallace become K.C.M.G. Mr. C. Gordon Watson receives the K.B.E. for his services on the Italian front. There are many other names, known as well to groups of our readers, which they will discover for themselves in the lists. Many of them stand for important advances made by our countrymen in the science of medicine. Those who have run have not run for the prize but for the joy of racing; the ceremony of prize distribution is none the less a graceful interlude in our Olympic festival, well appreciated by the spectators.

SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

Prospective Vacant Chair at Edinburgh University.

A COMMITTEE has been appointed jointly by the University and the managers of the Royal Infirmary to consider candidates for the Moncrieff Arnott Chair of Clinical Medicine in the University of Edinburgh, which becomes vacant shortly. The patronage of the chair is in the hands of the University Court, and the salary is understood to be £700 per annum.

Meeting of the Medical Profession in Edinburgh.

A meeting of the medical profession in Edinburgh and Leith was held on May 27th to consider questions concerning the extension and revision proposed for the National Insurance Acts. The meeting was largely attended, both by members of the British Medical Association and others, and the following resolution was passed unanimously: "That the proposal to raise the income limit for insured persons from £160 to £250 be uncompromisingly opposed."

Woman Doctor Sued by Member of the Q.M.A.A.C.

An action has been tried in the Court of Session, Edinburgh, in which a member of the Q.M.A.A.C., aged 19, with the consent of her father, sued Dr. Katherine S. Clark for £500 damages. The pursuer averred that she submitted herself to a medical examination at the hands of the defender in order that a suggestion of pregnancy which had been brought against her might be shown to be untrue, and this was thereby found to be a false charge. But in compelling her to strip absolutely naked the pursuer said that the defender acted in an unusual, unnecessary, and unprofessional manner, and committed an unnecessary and cruel outrage upon her feelings. As a result of this exposure in a cold chilly room without a fire she—the pursuer—had been permanently injured, and suffered periodically excruciating pain.

The defender, who is Medical Controller of the Q.M.A.A.C., said that she conducted the examination on behalf of the Crown in her capacity of medical officer attached to the Scottish Command, and that it was done in accordance with military regulations. It was arranged with the approval and consent of the pursuer with the object of refuting a rumour. The pursuer was not asked to undress and did not do so. While the room was without a fire there was one in an adjoining room, separated by a mere partition. The examination was conducted in the usual way, and the defender acted throughout in a strictly professional manner, and in accordance with medical etiquette. The pursuer's averments of permanent injury were denied.

Lord Anderson sustained the defender's plea that the pursuer's averments were irrelevant, disallowed the proposed issue, and dismissed the case with expenses to the defender. His Lordship said that in his judgment, before anyone who had suffered from a wrong done during a military service could come into a court of law and ask for a remedy by way of legal action, three averments were essential: (1) that injury had been sustained; (2) that the injury had been sustained by reason of an act fundamentally and completely illegal; (3) that the party doing the wrong had been actuated by malice. It seemed to him that the pursuer failed in the second and third of these heads because she did not complain that the examination was an illegal act, but merely that this legal act was done in a wrong way, and nowhere did the pursuer say that the defender, in conducting the examination in that way, was actuated by malice in so doing. Accordingly, he held that this was not the exceptional kind of case which was cognisable by a court of law.

June 4th.

IRELAND.

(FROM OUR OWN CORRESPONDENTS.)

Ulster Branch of the British Medical Association.

THE annual meeting of the Ulster Branch of the British Medical Association was held on June 5th in the King Edward Memorial Hall of the Royal Victoria Hospital, Belfast, when a most interesting series of demonstrations with exhibits, clinical and pathological, were shown. Mr. Robert Campbell (the President of the Branch) entertained to luncheon in the Medical Institute over 100 members of the medical profession from the North of Ireland.

The Ministry of Health Bill.

Some very curious revelations are gradually coming out in reference to the position Ireland occupies in the Ministry of Health Bill. When the measure was before the House of Lords the Government refused to make any alterations in Clause X. (setting up a Health Council in Ireland) on the ground that the clause was settled in its final form after consultation with Irish members of all sections (a statement also made by the Chief Secretary for Ireland to a deputation of Belfast medical doctors who appeared before him) and with "representatives of public health bodies." It now appears that the "representatives of public health bodies" were some members of the Irish branch of the General Medical Council. Dr. J. A. Macdonald, chairman of Council of the British Medical Association, speaking at a medical luncheon in Belfast on June 5th, said that when approached on the matter by an Irish member of the General Medical Council, he had replied that the matter of the Ministry of Health Bill, as it applied to Ireland, was one for the medical profession in that country, which possessed an Irish Medical Association, branches of the British Medical Association, and an Irish Medical Committee all of whom could be consulted by the Government, and that the General Medical Council or its Irish Branch had nothing to do with the matter. He advised the profession in Ireland to keep united, and, if so, he said the Government would have to come to them. Dr. Macdonald's remarks—all the more as he is a direct representative of the medical profession, elected by them—gave the greatest satisfaction to the large body of doctors whom he addressed, who take the view that the education and the ethical position of medical practitioners do concern the General Medical Council, but that such a question as a Health Bill is entirely outside their province, as they represent to such a limited extent the views of general practitioners.

Belfast Dental Clinic.

At the annual meeting of the Belfast Dental Clinic held on June 5th it was reported that instead of one clinic four were needed, and that it was hoped the coming schemes for the betterment of the people would include dental clinics. The Lord Mayor urged that the dental treatment of the nation's children (like vaccination) should be made compulsory.

Meetings of Delegates in Dublin.

A delegates' meeting of the medical profession of the whole of Ireland was held on June 3rd in the Royal College of Surgeons, when business of importance was transacted. Since 1913 when the Irish Medical Committee came into being—it was born of the controversies of the National Insurance Act—this body has represented Irish medical interests in much the same sense as these interests are represented by the Irish Branch of the British Medical Association. From the overlapping of function there has naturally resulted not a little friction between these two bodies. It was hoped that the meeting of delegates last

week would decide absolutely what machinery should act with authority for the profession. The first resolution on the agenda ran :—

"That this meeting of delegates authorise the Irish Medical Committee, constituted under the various resolutions of meetings of delegates, to represent the profession of Ireland in regard to proposed legislative measures affecting the interests of the profession, and in regard to the interests of the profession generally."

To this the President of the Irish Medical Association had tabled an amendment to the effect that the Council of the Irish Medical Association should be recognised as the executive of the profession. This amendment was withdrawn and after much discussion the original resolution was allowed to pass without opposition. The authority, therefore, of the Irish Medical Committee cannot be questioned for the present. The meeting, however, felt that some endeavour should be made to set up one representative organisation for the Irish medical profession. With this in view it requested the Irish Medical Association and the British Medical Association to nominate five members each to act with five members of the Irish Medical Committee to consider the best methods of attaining unity. There is little doubt that the two Associations will coöperate, but the task before the joint committee is by no means easy. The mere formation of the committee, however, is a good omen ; it shows that the profession as a whole is tired of wrangling and is sincerely anxious to arrive at some agreement. The remainder of the time of the delegates' meeting was given to questions arising out of the Ministry of Health Bill.

June 10th.

MEDICINE AND THE LAW.

Lay Members of Mixed Committees and Medical Questions.

THE London Panel Committee has raised an interesting question as to the extent to which a committee composed partly of lay representatives of the insured should be entitled to express opinions upon professional matters. In a recent case before the Medical Service Subcommittee it appeared that an insured person consulted a medical man on the panel for a cut lip. This he examined, and having satisfied himself that it was bathed and cleaned, took no further steps to assist the parts to heal. The Medical Service Subcommittee, in reporting upon the facts thus briefly summarised, found that the medical man was negligent and that the insured person was justified in obtaining treatment from another doctor. The London Panel Committee has expressed its opinion to the effect that the Medical Service Subcommittee has exceeded its proper functions by including in its report what is in effect a statement of its opinion as to the suitability of the treatment applied by the medical man on the panel. The Insurance Commissioners apparently take the other view. The matter is not one which need involve any criticism of the particular incident which raised the discussion, beyond pointing out that the case was obviously one in which two opinions might be held in a mixed committee. The medical men in it might be satisfied that the practitioner on the panel having the patient before him probably took a perfectly correct course. The laymen might regard his non-interference as proof of indifference to his patient's welfare. It is, therefore, an example, and quite a fair one, likely at any time to occur, of a matter as to which a mixed committee might arrive at a difference of opinion, and it seems strange that after the Insurance Acts have been in force for so long the point now raised should not have been settled beyond dispute. In the majority of cases, however, that are brought before the Medical Service Subcommittee, the complaint is of a refusal to attend at all, of delay in coming, or of personal conduct when in attendance, and the question whether refusing to treat is a proper course from a medical point of view does not arise at all. The question is one which is likely to come up again.

The Case of Henry Perry.

Mr. Justice Darling presided over the recent trial at the Central Criminal Court of Henry Perry, otherwise known as Beckett, for the murder of a father and mother of the name of Cornish and of their two young daughters. The case, which has become widely known as "the Forest Gate murder," had in it those elements of wholesale brutality and of aimlessness, except for a suggested desire to rob, which lead us to expect at murder trials a defence of insanity. This, in fact, was set up on behalf of Perry, the fact that he brought about the death of four persons being hardly in dispute. He had, among other things, made an elaborate confession to the police giving details of how the crime was committed. The evidence called for the defence was that of Sir Robert Armstrong-Jones, Dr. W. H. B. Stoddart, and Dr. H. J. Norman. And, without going into the details of their evidence, these gentlemen must be deemed to have satisfied themselves that Perry when he killed the Cornishes did not know the nature and quality of his acts sufficiently to render him liable at law to be punished for them. On the other hand, Dr. W. D. Higson, medical officer at Brixton Prison, called by the prosecution, did not consider the prisoner insane either now or when he committed the crime. He regarded him as of a low type of intelligence, but "not defective according to the Mental Deficiency Act." Perry had not said anything to him with regard to hallucinations, as to which Sir Robert Armstrong-Jones had given evidence. The jury appears to have accepted Dr. Higson's view without much question, and found the prisoner guilty after 10 minutes' deliberation, when he was sentenced to death. We have not seen the full text of Mr. Justice Darling's summing up, and are not sufficiently informed as to precisely how he treated the question of insanity and the medical evidence with regard to it. The latter was certainly entitled to considerable weight, and this view has been forcibly expressed by three medical Members of Parliament in a memorandum addressed to the Home Secretary. When the case comes before the Court of Criminal Appeal the defence of insanity will hardly be so lightly brushed aside.

Criminal or Moral Imbecile ?

A man named Edward Noel Craven was sentenced at the recent sitting of the Central Criminal Court to three years' penal servitude by Judge Atherley Jones, who observed that it would still be open to the Home Secretary to deal with the case and to give further consideration to medical evidence given in the course of the trial. This was to the effect that Craven was a moral imbecile, who had at one time been in a home under the Mental Deficiency Act. He had, however, also been convicted upon several occasions in the United Kingdom and in South Africa of various offences of dishonesty. On the present occasion he had obtained goods from Messrs. Mappin and Webb, which he paid for by a worthless cheque. He had bought the goods, which included a wedding ring, in the company of a young woman, but he was said to have a wife and children in Africa. From this wife, however, he claimed to have been divorced. He had deserted from the R.N.A S. and been sentenced by court-martial for so doing. He was also stated to have considerable ability as a civil engineer and to have been at the time of his offence in good employment as such. His case should be of interest to criminologists, and it seems not unlikely that the Home Secretary will give the attention to it which Judge Atherley Jones suggested.

Ritter v. *Godfrey.*

In the High Court of Justice Mr. F. Ritter, a barrister, sued Dr. T. H. Godfrey for damages for alleged negligence in attending the plaintiff's wife in her confinement. Mr. Justice McCardie, who tried the case without a jury, delivered judgment in the defendant's favour, reserving the question of costs for consideration. In stating the law his lordship said that every medical man was not only bound to use competent skill, but to give sufficient attention to his patients. The phrase "competent skill" does not, however, imply unusual ability or specialist acquirement. The case against the defendant was that he did not properly exert the skill that he possessed. In reviewing the evidence, which was concerned with the death at birth of the first-born child of the plaintiff by his second wife, Mr. Justice McCardie described how the defendant had had to deal with a double breech presentation, requiring quick action on his part. He had made a diagnosis which was in fact wrong, but he was not informed by the nurse, who was in attendance when he arrived, of a fact which it was material that he should know. He had not made external examinations which he might have done, but his lordship was not satisfied that by

not doing so he had been guilty of negligence. The professional reputation of the defendant depended largely upon the result of the case, and Mr. Justice McCardie considered that he would not be justified in finding him guilty of negligence unless it were upon the clearest and most impartial testimony. It was clear that the nurse who had given evidence for the plaintiff could not be regarded as entirely without bias, there having been some anger and annoyance existing between her and the defendant which had not disappeared. His lordship referred with disapproval to a letter which had been written by the defendant to the plaintiff as one which should not have been written in the circumstances by a member of the medical profession. This was a letter of 15 pages of an argumentative character offering, among other matters, to submit to arbitration the questions between the defendant and the plaintiff, with the forfeiture of fees on the one side and of a sum of money on the other, according to the result. In comment only cordial agreement with this portion of his lordship's judgment can be expressed. A medical man threatened with an action for negligence, or accused of negligence by or on behalf of a patient, should leave reply to his solicitor if he has neglected the precaution adopted by every prudent practitioner of joining one or other of the defensive organisations that are available.

Obituary.

GEORGE BERNARD BRODIE, M.D. ST. AND., F.R.C.P. LOND.,

CONSULTING PHYSICIAN-ACCOUCHEUR TO QUEEN CHARLOTTE'S LYING-IN HOSPITAL AND ST. GEORGE'S DISPENSARY.

George Bernard Brodie, who died at Folkestone on May 27th in his eightieth year, was, like his distinguished uncle Sir Benjamin Brodie, a student at St. George's Hospital, and lived to the same advanced age. In 1862 he qualified as a Member of the Royal College of Surgeons of England and graduated M.D. in the same year at the University of St. Andrews. Three years later he became a Member of the Royal College of Physicians of London, and in 1876 a Fellow of that College. He soon became interested in obstetrics and had a large consulting practice first at Chesterfield-street and later at Princes Gate. In 1868 he was commanded by Queen Victoria to attend the birth of her daughter the Princess Alice. He retired in 1903 and, although he has left no mark on the literature of his period, the memory of his genial good nature and keen sense of humour will remain for many years with all those who have known him.

THE LATE DR. J. WIGLESWORTH.

Sir George Savage writes: Dr. Joseph Wiglesworth, whose death, as the result of an accident, was reported in THE LANCET of May 24th, was for a time one of the leading authorities on insanity, its causes and treatment. For some years he was assistant medical officer at Rainhill Asylum near Liverpool, and he succeeded Dr. Rogers as superintendent of the asylum, becoming lecturer on mental diseases at the University of Liverpool. Already scientific work in asylums had been started by Dr. J. Crichton Browne, and Dr. Wiglesworth carried on research at Rainhill, contributing many articles to the *Journal of Mental Science*. His special work was in relationship to pachymeningitis and subdural hæmorrhage, and on this, as well as on other subjects, time has shown his work to have rested on a sound pathological basis. At Rainhill he devoted his spare time to botany, and he formed there an admirable garden of British plants. He was a quiet, rather reserved man, not given to sports or to social pleasures, but very thorough in his work, whether medical or administrative. That he was capable of steady and stern self-control was proved when having been stabbed in the neck by a patient he controlled the carotid artery by digital pressure till a Liverpool surgeon arrived. The shock, however, had a serious effect, and he was never the same again. Having retired on a pension, he devoted his leisure to bird study, one of his works being a book on the birds of St. Kilda.

Correspondence.

"Audi alteram partem."

THE RE-STOCKING OF LOUVAIN LIBRARY.

To the Editor of THE LANCET.

SIR,—The committee in charge of re-stocking the library at Louvain is anxious to have complete sets of British medical and scientific periodicals. The enclosed is a list of wants to complete existing sets of medical journals. The books may be sent to Mr. Henry Guppy, John Rylands Library, Manchester. I am, Sir, yours faithfully,

Oxford, June 9th, 1919. WM. OSLER.

List of Volumes required to Complete the following Medical Periodicals for the Louvain Library.

American Neurological Association Transactions: All except 35th and 37th annual meetings in 1909 and 1911.
American Pediatric Society Transactions: All except Vol. XXVI.
American Society of Tropical Medicine: Papers (all except Vol. III.).
American Association Medical Journal: All except year 1855.
British and Foreign Medical Review: Vol. XIX., XXVI. to completion.
British and Foreign Medico-Chirurgical Review. Vol. XXIV., XXVII. to completion.
British Medical Journal: All from Vol. II. for 1869.
Canstatt's Jahresbericht: From 1856 onwards.
Epidemiological Society, London: Vols. I., II., and N.S. VI., N.S., XIX. to date.
Ireland: Royal Academy of Medicine, Transactions: Vols. I.-III., V., XIV. to completion.
The Lancet: All except volumes for 1868 and 1880.
Medical Sciences: The half-yearly abstract, Vols. I.-VI., XI.-XXXIII., XLIV to completion.
Medical Times and Gazette: All except Vol. II., 1863, and Vol. I., 1869, New Series, and XXIX. of New Series.
Pathological Society, London: Vols. III., VIII., XX., XLI.-XLVIII., L. to completion.
Retrospect of Medicine: Edited by W. Braithwaite. Vols. I.-XVIII., XX.-XLIII., XLVI., XLVIII.-LIV., LVI., LVIII.-LX., LXII.-LXIV., LXVIII., LXXII., LXXVI., LXXVII., LXXXI., LXXXIV., LXXXV., XC., XCI., CIII., CV. to completion.
Royal Medical and Chirurgical Society, London: Vols. I.-XXXIII., LXXVI., LXXVII., LXXXII. to complete.
Clinical Society, London: Vols. XLI. to completion.
Archives de Médecine Expérimentale: Vols. I.-IV., VI., XII., XVII. to completion.
British Association Reports: Vols. I.-XXXVII., XXXIX.-LIII.
Chemical Society of London Journal: Vol. I.-LXVI. *Proceedings:* Vols. I.-X.
Eugenics Review: Vols. I., II., IV. to completion.
Nature. Vols. XCII. to completion.
Physical Society of London Proceedings: Vols. I.-XXV., XXX. to completion.
Revue Neurologique: Vols. XIII.-XVI., XVIII. to completion.
Victoria Institute Journal: Vols. I.-XXVIII., XXXIII., XLII. to completion.

*** We shall be glad to assist in obtaining for the Louvain Library a complete set of bound yearly and half-yearly volumes of THE LANCET. A number of such volumes are available at this office, and, to avoid overlapping, we suggest that readers willing to supply certain volumes of the series should communicate with us before sending them to Mr. Guppy.—ED. L.

THE GENERAL PRACTITIONER'S HOSPITAL.

To the Editor of THE LANCET.

SIR,—I wrote this letter some weeks ago, and reading Dr. W. E. Fothergill's plea in THE LANCET of May 24th for the maternity hospital, have felt impelled to send you my plea for "the general practitioner's hospital." It is generally agreed, in the medical profession at any rate, that there is an urgent need for increased hospital accommodation, but there has been no suggestion as to how this is to be distributed.

Special Hospitals and Cottage Hospitals.

In considering the question we may divide hospitals into two groups, the first group contains: (*a*) the special hospitals, that is, those hospitals devoted to the treatment of one particular disease or group of diseases, or one method of treatment, and staffed entirely by specialists; and (*b*) the general hospitals, which are made up of special departments, each department staffed by men who are more or less specialists. The second group consists of the so-called cottage hospitals. I say "so-called" because, considering the place they are likely to be called upon to take in any scheme of medical service, the name is not a good one. It served its purpose well enough at one time. I would suggest such a term as auxiliary, district, or local. The first, used in the

manner with which we are acquainted in military and Red Cross hospitals, would better define their position and function.

Though the hospitals in the first class will have to be enlarged, and at the same time freed of some of their non-essential work, they will not require increased bed accommodation in the same proportion as the auxiliaries, they are essentially the hospital of the specialist and the consultant, the latter are the hospitals of the general practitioner. It is important that we should make this distinction clear at the outset, as it helps us to define and to realise the scope of the work, and hence the requirements of both sets of institutions, though at present my intention is to deal only with the auxiliary hospital.

Advantages to the General Practitioner.

The work of the individual general practitioner represents, as it were, in embryo the work of the general hospital. He has to have departments equipped to deal with any sort of case that may turn up, and like those hospitals he will probably have some departments better equipped than others; some, perchance, hardly provided for at all. To him the auxiliary hospital would be practically a nursing home where he could be sure that he would have a proper opportunity for using his powers of diagnosis and treatment, the institution being often as much needed for the former as for the latter. And what cases is he going to put into his hospital? Not only the accidents and surgical cases, with which in the past it has been too much the custom to associate the cottage hospital. He is going, if he takes full advantage of his opportunities, to send in all those cases in his practice which he realises cannot in their homes get the best value from his knowledge and skill because of the want of opportunities for diagnosis and treatment which can be obtained in that institution. He will exclude those cases which he knows require the skill, experience, and special facilities to be found in the central hospital. But if he sends in all the cases suggested he will find that they are many more than he has been in the habit of sending. (If the hospital is properly arranged as to paying beds it will be able to take in cases from any class of society.) He will send in cases requiring careful observation for diagnosis as regards temperature, digestion, nerve symptoms, urine, &c.; cases requiring careful nursing, dieting, rest, massage, regular exercise, and all sorts of routine treatment which it is almost impossible to ensure at home; patients requiring that psycho-therapy which attaches to a well-staffed, well-managed hospital; men or women showing any of the numerous signs or symptoms of over-fatigue, which may so often be cured by timely well-ordered rest.

How much serious illness might be prevented if only, before it is well established, we could give patients a tithe of that attention they receive when their condition is desperate, and how often we would give it if only we had the chance. Again, how many lesser ailments, for want of this help, drift on until they become, or lead to, something so serious that all the skill and care of the central hospital is of little avail.

Auxiliary Hospitals for Obstetric Cases.

It is not possible, neither is it necessary here, to specify all the varieties of patient who might with advantage be treated in such an institution and who are at present perforce attended to (we can hardly say treated) at home. There is one class of patient so important and so constant in general practice that it must be mentioned. I refer to the group of midwifery cases. The care required in the surroundings, the management, in the nursing and treatment, and the difficulty of providing all, sometimes any, of these in the home are an obvious argument in favour of admitting pregnant women to some place where all these things can be controlled, where the ordinary necessary appliances are at hand, and where there is sure to be skilled nursing. The advantage to the patient and the child, the relief to the mother's home, the saving of the district nurse's time and energy, the opportunity that the medical man will have for the full exercise of his skill, the relief to his mind and body, must all be such that once we become accustomed to treating our maternity cases in hospital we shall wonder how we ever did otherwise.

A Department for Out-patients.

In this auxiliary hospital there should be a department for out-patients. This has not been customary in the cottage hospital, but I am sure it would be to the advantage both of the patient and the doctor to have some place where all the cases that require frequent attention by a trained nurse could receive it. This, again, might be a great saving of the time and strength of the district nurse, and the work would be done under supervision and better conditions.

To this hospital could also be sent many of those cases from the central hospitals which are kept there occupying beds that are urgently required for other cases and are not sent out because there is no suitable place to which to send them.

How many more beds will be required in these auxiliary hospitals it is at present impossible to say; neither do I see any chance of being able to give a definite answer to this question by the use of any available statistics, because we are going to provide for a class of case which has not hitherto been provided for except in a very small way. I have myself at times made a note of all the cases in my practice that I would like to have treated in hospital, and I have always come to the conclusion that I should want something like three or four beds for every thousand of population. The figures were, for many obvious reasons, much too haphazard to be of any real use, but since coming to that conclusion I have seen the report of the Committee of Inquiry of the Fabian Research Department into the working of the Insurance Act, and it, working from quite different data, came to much the same conclusion.

The Essentials of Treatment.

I have dealt so far with what one might call the humane and economic value of these hospitals to the community, but they would also serve to educate the public as to the essentials of treatment. Here they will learn that hospitals in the past have been too much generally associated with the idea of surgery, to the exclusion of other forms of treatment, that the observation, the nursing, the routine, and care which patients receive in an institution are generally of more importance than drugs. They will learn that hospitals are as necessary for the adequate treatment of minor maladies as of grave disease. Again, the public would benefit individually; in a given time a medical man would be able to do more work, and more effective work, than he can when he has to spend much of his time travelling from patient to patient, and in the patient's home doing much that would be unnecessary in hospital.

Educational Value of Ample Hospital Accommodation.

Sir Bertrand Dawson has said: "Though it is quite right that consultants and specialists should be available to help the general practitioner, this is not nearly so important as providing the general practitioner with the means to help himself." I know of no means likely to be more effective than the provision of ample hospital accommodation. This, of course, must eventually be part of any scheme of medical service, but it is a part that might well be instituted at once. It is a part that would appeal at once to the public and the practitioner. What can be more disheartening in a doctor's life than to realise that, try as he will, so much of his work is in vain? As years go on he realises that much of his work is degenerating because he cannot keep up that keen scientific interest with which he began his medical life. He cannot keep up his interest, and he knows that it is because he has not the opportunity for doing so. The cry of the keen man has ever been "Give me opportunity." No man who is keen about his work can be happy in it unless he has a chance to do that work properly. He will not be saved from his despair by others doing it for him, as some of the schemes for a reformed medical service lately propounded seem to suggest. He realises to the full what will happen if all incentive to good work and responsibility is taken from him bit by bit, he knows that he will be left little better than a well-drilled automaton, and what solace is it to his vain hopes to realise the view of his abilities that seems to be held by some of our would-be reformers. He is offered not the means of developing himself, his mind, his talent, his power to cope with difficulties and to shoulder responsibilities, but to be taken in hand at every twist and turn by specialists and consultants. He is, in effect, told not to rely on himself too much, but to learn to turn in all cases of difficulty to those whose life-work it is to deal with that particular difficulty. It is inferred that his ambition must be to work in an allotment in the fields of specialism, doing work of intense interest and great importance, or to

peg out a claim in the unexplored land of original research, with its fascination and its chances of finds better than gold. But he may dislike these narrow bounds and prefer to work in the open country, travelling over its rough roads with its surprises, its difficulties, and its delights, every mile gathering strength to his limbs and breadth to his views as he rises higher on the hills from which he can survey the whole of the wonderful country of medicine with its well-tilled fields, its fruitful gardens, its forests, its wildernesses, its undiscovered wealth of means of cure and prevention.

Summary.

Whatever scheme for an improved medical service may be adopted by the Ministry of Health, there can be little doubt but that institutions somewhat on the lines above indicated will have to form part of it, and I see no reason why we should wait for a complete scheme before starting them; in fact, there are many reasons why it would be better to set them up as soon as possible, and now that many projects are being discussed as war memorials there is an excellent opportunity.—I am, Sir, yours faithfully,

Bradford-on-Avon, May 26th, 1919. CHAS. E. S. FLEMMING.

EPIDEMIC PERINEPHRIC SUPPURATION.

To the Editor of THE LANCET.

SIR,—At the close of his interesting letter in your issue of June 7th Mr. Joseph Cunning invites information from others relative to the occurrence of this important disease-process. I agree with Mr. Cunning that the incidence of this type of case has been greater of late than formerly. I do not think it has any causative relation to influenza, as he suggests; I think it is only a part of the general rise in incidence of staphylococcus infections that has constituted a striking "war disease." Furunculosis, sycosis, impetigo, blepharitis—all of these have been rife and the cases have been individually more severe than is usual. Soldiers brought home a particularly virulent strain of *S. aureus*, and civilians have no doubt suffered a lowering of their resistance to staphylococcus infection as a result of war conditions.

As to perinephric abscess due to *S. aureus* (there is internal evidence in the record of Mr. Cunning's fourth case, in which the infection was due to streptococcus, that the pathogenesis was different from that of his other cases), I regard this condition as being most often of the nature of pyæmic abscess. The point of primary infection may be easily overlooked, especially if this view of things be not kept well in mind. I have recently seen a case in which no history of a primary infection was forthcoming until inquiry elicited the fact that a neglected boil had been present on the scalp just before the malaise and fever which preceded the signs of suppuration in the loin. That the perinephric cellular tissue is one of the favourite sites for a pyæmic focus in *S. aureus* septicæmia may be readily demonstrated by injecting living staphylococci into the blood stream of rabbits. So important a clinical fact is this that the knowledge of it occasionally determines the choice of operative procedures in a case of known *S. aureus* infection, in which there arise symptoms which may be due either to intra- or to retro-peritoneal suppuration—a very considerable saving to the patient.

The absence of symptoms indicative of disease of the kidneys in Mr. Cunning's cases tends to confirm this view of their real nature. But to me the attention drawn by your correspondent to the perinephric connective tissue is opportune, because I hope very shortly, in conjunction with a colleague, to adduce facts tending to show that this tissue is of considerable importance in relation to certain kidney diseases, and that its rôle in certain types of nephritis has been overlooked.

I am, Sir, yours faithfully,

Harley-street, W., June 9th, 1919. THOMAS HORDER.

To the Editor of THE LANCET.

SIR,—I venture to support Mr. Joseph Cunning's suggestion that the primary disease in the striking series of cases of perinephric suppuration described by him in THE LANCET of June 7th was the recent epidemic of influenza. I have myself encountered within five weeks four cases similar to his, and I had formed the opinion that they were associated with influenza, partly by the exclusion of any other obvious cause and partly by definite connexion with an attack of influenza.

Although the paper contributed to your columns by Colonel H. French, Captain N. Hallows, and myself (THE LANCET, Jan. 4th, 1919) embodied the experience of several thousand cases of influenza with a large variety of complications, not one example of the condition now under consideration had up to the time of its publication been encountered.

The first case of perinephric suppuration was admitted to the Connaught Hospital, Aldershot, in February, 1919. He had been transferred from France as a case of tuberculosis with pleurisy. He complained of persistent pain in the right lumbar region, and it was evident that an inflammatory swelling was present which was almost certainly abdominal and not thoracic. I explored and found thick pus without any difficulty. He was immediately operated upon by Major James Taylor, R.A.M.C., my surgical colleague at the Cambridge Hospital, and made a speedy and complete recovery. No abnormality was present in the urine, and Major Taylor was convinced that the kidney was quite free from disease. As an additional point of interest, pleural fluid only slightly turbid was present on the same side, and this Major Taylor believed to be the result of infection through the diaphragm, exactly as in one of the cases described by Mr. Cunning.

Within a fortnight two similar cases occurred in the hospital in patients who had suffered from definite attacks of influenza, and these again were transferred to Major Taylor, and equally rapid recovery followed operation.

Three weeks later I was asked to see in consultation a civilian, who complained of pain of a rather widespread and indefinite character, with an acute onset and pyrexia. I could discover no obvious cause, but in the light of recent experience I suspected perinephric suppuration. I was unable, however, to support this diagnosis by exploration. Several weeks later an abscess definitely appeared, and was again successfully treated by Major Taylor.

I had intended at some future date to include these cases in an addendum to the paper to which I have referred, for so far as I am aware this peculiar condition has not yet been described.

I am, Sir, yours faithfully,

ADOLPHE ABRAHAMS, Major R.A.M.C.,
O.C. Medical Division, The Connaught Hospital, Aldershot; District Consulting Physician, Aldershot Command.

June 9th, 1919.

THE ORIGIN OF LIFE: THE WORK OF THE LATE CHARLTON BASTIAN.

To the Editor of THE LANCET.

Sir,—May I add a small contribution to the question of Bastian's work in response to the recent letters in your columns? I have been trying some of the experiments specially advocated by Bastian, working during the time which has elapsed since his death. My endeavours to obtain organisms from chemical solutions have been unsuccessful, though I have not been able to fulfil the condition of having the cultures in the open air. The statements regarding microbic characters of urines have also not been confirmed.

The quest I had in view, however, was not to be furthered so much by demonstrating the correctness or not of "spontaneous generation" as by finding evidence of heterogenesis. There are many statements in Bastian's book on heterogenesis which are certainly borne out by my experience. But they would not have been borne out had I not been able to preserve my fluids unmolested for many months—namely, by using a room which no one enters but myself or someone whom I can trust to refrain from disturbing the specimens in any way. This condition seems to be impossible in an ordinary bacteriological laboratory.

I have found that the fauna and flora vary with the depth of the vessel containing the water and with the area exposed to the air; that they vary according to whether the fluid is kept perfectly still or whether it is disturbed by vigorous shaking; that different organisms come in different infusions; that some dried plants fail to give cultures, however contaminated they ought to become. The following items in the book referred to have been confirmed: pp. 308, 306, 183; and changes similar to those mentioned intermittently in pp. 178–215. The use of the term "germinality" seems justifiable. Failure to establish "spontaneous generation" is no argument against "heterogenesis." Mutation of organisms is an instance of part of a heterogenetic cycle

being known and accepted. Cyclical changes in organisms cannot be accomplished without changes in their substrate.

Some "cocci," in colonies of streptococci or staphylococci, appear to be sporangia, whose contents are virtually ultramicroscopic. This would account for the difficulty of tracing the path of organisms in nature. Observation of the inhabitants of fresh-water collections would lead one to suppose that there are so many factors at work *depending on one another* that it is equally hard to be conclusive about Bastian's ideas as about the system of rigid closed circles to which modern bacteriology tends to restrict itself. Many people working in as many localities with the view to detecting whether there is not after all an *intimate* connexion between these lower forms of matter and the medium in which they occur at the moment might bring forth data which would be a worthy fruitage to Bastian's labours.—I am, Sir, yours faithfully,

Leeds, June 10th, 1919. O. C. GRUNER.

COMPULSORY GREEK AT OXFORD?

To the Editor of THE LANCET.

SIR,—We, the undersigned members of the Board of the Faculty of Medicine, teachers in the Medical School, and resident medical graduates, appeal to all Oxford medical graduates who are members of Convocation[1] and are opposed to compulsory Greek, to come to Oxford on Tuesday, June 17th, and by their votes in Convocation at 2 o'clock support the Statute rendering Greek *optional* in Responsions.

We are, Sir, yours faithfully,

ARTHUR THOMSON,
Exeter College; Professor of Human Anatomy.
A. P. DODDS-PARKER,
Magdalen College; Lecturer in Applied Anatomy.
S. E. WHITNALL,
Magdalen College; University Demonstrator in Human Anatomy.
C. S. SHERRINGTON,
Fellow of Magdalen College; Professor of Physiology.
H. C. BAZETT,
Fellow of Magdalen College; Welch Lecturer in Clinical Physiology.
G. DREYER,
Fellow of Lincoln College; Professor of Pathology.
E. W. AINLEY WALKER,
Fellow and Tutor of University College; Lecturer in Pathology.
A. G. GIBSON,
Christ Church; Lecturer in Morbid Anatomy.
A. D. GARDNER,
University College; Bacteriologist, Standard's Laboratory, Department of Pathology.
J. A. GUNN,
Queen's College; Professor of Pharmacology.
S. H. VINES,
Fellow of Magdalen College; Professor of Botany.
G. C. BOURNE,
Fellow of New College; Professor of Zoology and Comparative Anatomy.
W. H. PERKIN,
Fellow of Magdalen College; Professor of Chemistry.
D. H. NAGEL,
Fellow and Tutor of Trinity College.
W. COLLIER,
Exeter College; Hon. Physician, Radcliffe Infirmary.
W. T. BROOKS,
Christ Church; Litchfield Lecturer in Medicine; Hon. Physician, Radcliffe Infirmary.
R. H. ANGLIN WHITELOCKE,
Exeter College; Litchfield Lecturer in Surgery; Hon. Surgeon, Radcliffe Infirmary.
C. G. DOUGLAS,
Fellow and Tutor in Natural Science, St. John's College.
A. L. ORMEROD,
New College; M.O.H., City of Oxford.
E. MALLAM,
Magdalen College; Hon. Physician, Radcliffe Infirmary.
C. SINGER,
Tutor of Exeter College.
G. B. CRONSHAW,
Fellow and Bursar of Queen's College; Hon. Treasurer, Radcliffe Infirmary.
H. M. VERNON,
Fellow of Magdalen College; Investigator to the Industrial Fatigue Research Board.

Oxford, June 9th, 1919.

CHRONIC SECONDARY COLITIS.

To the Editor of THE LANCET.

SIR,—In an article entitled "Certain Chronic Colopathies," by Dr. Edouard Joltrain, Dr. Paul Baufle, and Dr. Robert Coope, published in your issue of May 31st, attention is drawn to the very important fact that acute inflammations of the colon are often followed by a secondary colitis of a markedly chronic type. (The term "colopathy," which is used to describe the condition, seems to me an unnecessary and painful addition to the nomenclature of the subject.) For years I have frequently had to treat these cases of secondary chronic colitis, and can endorse all the authors say as to their chronicity and the difficulties of obtaining a cure. My own view is that the acute disease, whether it be amœbic dysentery, or some other acute colitis, acts as the agent in introducing a secondary infection into the mucosa of the colon. This secondary infection, often a streptococcus, penetrates into the deep layers of the mucosa, and is very difficult to eradicate. The infection will often lie dormant for a long period in the deep layers of the mucosa only to flare up violently when the general health of the patient is lowered by a cold or some other ailment.

An examination at periodical intervals with the sigmoidoscope is often most useful in diagnosis. The treatment which I have found most useful is lavage of the bowel with antiseptics such as the various silver preparations in suitable dosage, combined with the use of intestinal antiseptics in full doses, and the administration of charcoal. The important thing is to repeat the treatment at short intervals independently of the presence of any symptoms, the object being to destroy any organisms that may have escaped the previous treatment, and to prevent their remaining to restart the trouble when favourable conditions occur. In obstinate cases which refuse to respond to such treatment an appendicostomy opening should be established to allow of the colon being kept thoroughly washed out. The resulting improvement is often startling. These cases suggest that it is not so much the persistent character of the infection which makes a cure difficult as our inadequate means of dealing with it in such a large area as the colon.

I am, Sir, yours faithfully,

J. P. LOCKHART-MUMMERY.

Hyde Park Place, W., June 7th, 1919.

[1] Any Master of Arts or Doctor of Medicine whose name is on the books of his College is a member of Convocation.

ABSENCE OF CANCER IN THE ARCTIC REGIONS.

To the Editor of THE LANCET.

SIR,—Referring to my letter on the above subject, printed in THE LANCET of March 29th, I enclose a copy of a letter that I have received from Mr. W. R. Barlow, of Newfoundland, confirming Mr. V. Stefansson's investigations. Of course, negative observations have not the value of positive ones, but the available figures, when corrected by the Poisson formula, leave little doubt that cancer is non-existent, or at all events very rare, among the natives of the Far North. I am, Sir, yours faithfully,

Clinical Laboratory, Ministry of National Service, 62, Conduit-street, W., June 6th, 1919. H. C. ROSS.

[ENCLOSURE.]

DEAR SIR,—With reference to your letter "Absence of Cancer in the Arctic Regions," printed in THE LANCET of March 29th, 1919, I spent two and a half years on the Labrador coast, stationed at Okak Hospital—an Eskimo settlement—and the district in which my work lay was from Makkovik to Cape Chidley, comprising about six settlements of Eskimo—about 1200 natives. I visited these settlements regularly, summer and winter, and never saw a case of cancer, and there was no record of a case in the hospital records, a period of some eight years. Labrador can hardly be considered as being in the arctic regions, as, though the "fall," winter, and spring, are very cold, the two months of the summer can be very hot. I might add that I have talked to missionaries resident on the coast for over 20 years and they cannot recall any case of cancer occurring among the natives, though one case occurred in a missionary's wife—a German—who went home and had her breast removed. I thought you might consider the above interesting.

Yours sincerely,

Trinity, Newfoundland, April 22nd, 1919. W. R. BARLOW.

MEDICAL MEN AND SHARE HOLDING.

To the Editor of THE LANCET.

SIR,—I received a circular a few days ago which involves a most important matter of principle. It was from a company engaged in the manufacture of proprietary articles, intimating that more preference shares were to be issued, and contained the following sentence: "..... recognising the merit of the present movement towards coöperation in industry, my directors are confining the present issue to members of the medical profession, members of the Pharmaceutical Society actually in business on their own account, and the milk suppliers." To my mind this is the thin end of a most dangerous wedge, and I think that the General Medical Council should take the matter up and give a ruling on the

propriety of a practitioner of medicine holding such shares. It need not be pointed ont—it is only too obvious—what may be the ultimate results of such a practice should it become at all common; and it is not difficult to see that an individual doctor might find himself in a very false position if he had financial interest in such a company. In these days, when luckily, there is some attempt being made to bring the "purity of public life" to somewhere near the Victorian standard, I think that it is most essential that the medical profession should keep its hands scrupulously clean if it is to retain that trust that the public has always reposed in it.

I am, Sir, yours faithfully.

Clifton, Bristol, June 7th, 1919. R. C. CLARKE.

A MEATLESS DIETARY IN EPILEPSY.

To the Editor of THE LANCET.

SIR,—I am anxious to know the foundation for the non-meat diet in epilepsy. Is it based on experience, or does it depend on some general physiological belief? It is important to be certain on the matter, as epileptic sol liers object to the restricted diet. I am, Sir, yours faithfully,

Whitchurch, Hants, June 9th, 1919. G. H. SAVAGE.

The War and After.

THE CASUALTY LIST.

THE names of the following medical officers appear among the casualties announced since our last issue :—

Died.

Surg.-Lieut. E. G. Fisher, R.N., was educated at Cambridge University and at St. Thomas's Hospital, London, and qualified in 1912. He held appointments at the Royal Infirmary and at the Hospital for Consumption, Liverpool, and also at the City Hospital, Fazakerley.

Capt. E. M. Parsons-Smith, R.A.M.C., was a student at St. Thomas's Hospital, London, and qualified in 1908. He joined the R.A.M.C. shortly afterwards, and was for some time attached to the Egyptian Army.

Wounded.

Capt. J. E. Carpenter, R.A.M.C.

THE HONOURS LIST.

The following names of medical officers and others, additional to those published in THE LANCET of last week, are included in the several supplements to the *London Gazette* announcing the bestowal of honours in connexion with the King's birthday. The headings denote generally the sphere of operations in which the recipients were engaged. Except where otherwise indicated all are members of the R.A.M.C.

K.C.M.G.—Hon. Sir J. McCall, M.D., Agent-General in London for Tasmania, Australia.

Knights Bachelor.—Dr. J. Baker, Superintendent of the Broadmoor Lunatic Asylum; Mr. D. Shields, Administrator and Surgeon-in-Chief of the Hospital at 17, Park-lane, which he gave free of charge for the use of the War Office.

C.B.—Dr. R. W. Branthwaite, Board of Control.

C.V.O. Sir A. C. Houston K.B.E., Director of Water Examinations to the Metropolitan Water Board; Dr. J. M. Bruce, Consulting Physician to King George's Hospital.

O.B.E.—Dr. J. Lochhead, M.B.E., Surgeon, Colonial Hospital, Gibraltar; Surg.-Capt. O. W. Andrews, R.N.

M.B.E.—Dr. A. V. Bernard, for services in connexion with hospital and nursing work in Malta; Dr. A. Critien, for medical services during the war, Malta; Dr. S. A. Fetherstone-Dilke, Assistant Surgeon, Colonial Hospital, Gibraltar.

Home, &c., Services.

K.C.B.—Maj.-Gen. (temp. Lt.-Gen.) Sir W. Babtie, V.C., K.C.M.G., C.B., K.H.S.

K.B.E.—Col. (temp. Maj.-Gen.) G. B. Stanistreet, C.B., C.M.G., A.M.S.; Lt.-Col. (temp. Col.) H. Davy, C.B. (T.F.); Lt.-Col. and Bt. Col. G. S. Woodhead, O.B.E. (T.F.); Lt.-Col. Sir S. F. Murphy, Kt. (T.F.); Lt.-Col. D'A. Power (T.F.); Maj. (temp. Lt.-Col.) H. McI. W. Gray, C.B., C.M.G. (T.F.); Maj. (temp. Lt.-Col.) Sir A. W. Mayo-Robson, Kt., C.B., C.V.O. (T.F.); Maj. (temp. Col.) C. J. Symonds, C.B. (T.F.); Maj. and Bt. Lt.-Col. F. W. Mott, F.R.S. (T.F.); Maj. (temp. Maj.-Gen.) Sir R. Jones, Kt., C.B. (T.F.); Capt. (temp. Lt.-Col.) A. D. Reid, C.M.G. (T.F.).

C.B.E.—Temp. Lt.-Col. Sir R. Armstrong-Jones; Lt.-Col. (temp. Col.) H. G. Barling, C.B.; Lt.-Col. (temp. Col.) L. J. Blandford (T.F.); Temp. Maj. and Bt. Lt.-Col. F. S. Brereton; Bt. Col. A. W. Browne; Lt.-Col. J. Calvert (T.F.); Temp. Col. A. Carless, A.M.S.; Temp. Col. Sir A. Chance, A.M.S.; Lt.-Col. and Bt. Col. R. J. C. Cuttell; Temp. Lt. Col. M. Craig; Maj. P. G. Easton, D.S.O.; Temp. Maj. (temp. Lt.-Col.) W. B. Edwards, O.B.E. (T.F.); Capt. and Bt. Maj. (acting Lt.-Col.) E. H. Fenwick (T.F.); Lt.-Col. H. French; Lt.-Col. and Bt. Col. A. B. Gemmel (T.F.); Temp. Hon. Lt.-Col. M. H. Gordon, C.M.G.; Lt.-Col. Sir A. P. Gould, K.C.V.O. (T.F.); Col. R. I. D. Harkett (R. of O.); Lt.-Col. and Bt. Col. L. K. Harrison (T.F.); Lt.-Col. D. Harvey, C.M.G.; Lt.-Col. and Bt. Col. H. P. Hawkins (T.F.); Temp. Lt.-Col. F. R. Hill; Temp. Maj. (temp. Lt.-Col.) W. de M. Hill; Col. R. H. Johnston, C.B., late R.A.M.C.; Maj.-Gen. O. R. A. Julian, C.B., C.M.G., A.M.S.; Lt.-Col. C. A. Lees (T.F.); Temp. Lt.-Col. J. R. Lord; Maj. and Bt. Lt.-Col. A. P. Luff; Lt.-Col. and Bt. Col. F. Marsh (T.F.); Lt.-Col. J. F. Martin, C.M.G.; Temp. Lt.-Col. G. E. Miles; Lt. Col. and Bt. Col. R. R. H. Moore; Lt.-Col. and Bt. Col. C. W. M. Moullin (T.F.); Temp. Col. J. F. O'Carroll, A.M.S.; Col. D. O'Sullivan, A.M.S.; Maj. and Bt. Lt.-Col. H. J. Parry, D.S.O.; Temp. Col. J. H. Parsons, D.Sc., A.M.S.; Temp. Lt.-Col. A. M. Paterson; Lt.-Col. L. W. Rolleston; Temp. Hon. Lt. Col. R. G. Rows; Temp. Col. J. Sherren; Lt.-Col. P. C. Smith (T.F.); Temp. Hon. Lt.-Col. T. E. K. Stansfield; Maj. (temp. Col.) J. Swain, C.B.; Temp. Lt.-Col. D. G. Thomson; Col. O. Todd, late R.A.M.C.; Col. C. R. Tyrrell, C.B., late R.A.M.C.; Lt.-Col. F. S. Walker; Lt.-Col. S. White (T.F.); Lt.-Col. (temp. Col.) A. S. Woodwark, C.M.G.

O.B.E.—Capt. (acting Maj.) A. Abrahams; Maj. M. D. Ahern; Maj. F. W. Andrewes; Temp. Lt.-Col. H. G. Ashwell; Temp. Lt.-Col. G. A. Bannatyne; Lt.-Col. H. A. Berryman (R. of O.); Maj. and Bt. Lt.-Col. R. A. Bolam (T.F.); Temp. Maj. R. H. Brembridge; Capt. A. B. H. Bridges; Capt. R. C. Brown; Maj. G. R. Bruce (S.R.); Maj. W. Byam; Temp. Maj. E. P. G. Causton; Temp. Maj. O. Challis; Temp. Capt. (acting Maj.) B. J. Collingwood; Maj. M. A. Cooke (T.F.); Lt.-Col. M. P. Corkery; Maj. E. J. T. Cory (T.F.); Maj. C. Crawley; Maj. (acting Lt.-Col.) E. N. Cunliffe (T.F.); Temp. Lt.-Col. W. R. Dawson; Temp. Maj. J. A. Devine, D.S.O.; Capt. (acting Maj.) R. M. Dickson; Lt.-Col. H. P. Dimmock, I.M.S.; Temp. Capt. P. W. Dove; Capt. R. S. O. Dudfield (T.F.); Maj. A. Ehrmann (T.F.); Capt. and Bt. Maj. R. C. Elmslie (T.F.); Capt. A. H. Evans (T.F.); Capt. (acting Maj.) C. H. J. Fagan (T.F.); Lt.-Col. H. G. Falkner (T.F.); Temp. Maj. W. T. Finlayson; Maj. (temp. Lt.-Col.) G. W. Fitzgerald (T.F.); Capt. and Bt. Maj. A. G. R. Foulerton (T.F.); Capt. and Bt. Maj. C. C. Frye (T.F.); Capt. C. J. D. Gair (T.F.); Capt. J. A. Glover; Capt. F. L. Golla (T.F.); Lt.-Col. E. W. Goodall (T.F.); Temp. Capt. A. Goodwin; Maj. A. C. E. Gray; Capt. and Bt. Maj. (acting Lt.-Col.) R. L. Guthrie (T.F.); Lt.-Col. M. L. Hearn; Temp. Hon. Maj. T. G. M. Hine; Temp. Maj. W. E. Home; Capt. E. C. Hughes (T.F.); Temp. Maj. (acting Lt.-Col.) A. F. Hurst; Capt. G. J. Jenkins (T.F.); Maj. (acting Lt.-Col.) E. B. Lathbury; Maj. J. R. Lee; Temp. Hon. Lt.-Col. P. Macdiarmid; Capt. A. G. Macdonald; Maj. (acting Lt.-Col.) D. K. McOowell, C.M.G.; Capt. (temp. Maj.) E. F. W. Mackenzie, M.C.; Lt. (temp. Maj.) A. D. MacKinnon, C.M.G., Gen. List; Maj. and Bt. Lt.-Col. A. McMunn; Capt. A. G. Maitland-Jones, M.C.; Hon. Capt. C. H. Milburn (T.F.); Capt. (acting Maj.) G. W. Milne; Temp. Lt.-Col. A. B. Mitchell; Temp. Maj. J. S. Morrow; Capt. J. Muir (T.F.); Temp. Capt. E. G. D. Murray; Temp. Capt. W. A. Murray; Lt.-Col. R. J. W. Oswald (T.F.); Lt. Col. C. T. Parsons; Maj. (acting Lt.-Col.) D. W. Patterson (T.F.); Temp. Capt. A. C. Pickett; Maj. W. R. Pirie (T.F.); Maj. G. N. Pitt (T.F.); Maj. (acting Lt.-Col.) T. J. Potter; Temp. Lt.-Col. S. S. Pringle; Temp. Lt.-Col. W. T. Prout, C.M.G.; Temp. Maj. F. C. Purser; Maj. (acting Lt.-Col.) B. Riddell (T.F.); Capt. R. P. Rowlands (T.F.); Maj. and Bt. Lt.-Col. C. Rundle (T.F.); Capt. (acting Maj.) T. Russell (T.F.); Capt. T. Sheedy (S.R.). Capt. (acting Maj.) G. W. Shore T.F.); Maj. A. B. Smallman, D.S.O.; Lt. Col. J. C. C. Smith, I.M.S.; Maj. W. G. Spencer (T.F.); Maj. A. C. Stamberg; Lt.-Col. A. B. S. Stewart (T.F.); Temp. Capt. (acting Maj.) W. H. Stott; Maj. R. H. J. Swan; Maj. C. L. D. Taylor; Capt. (acting Maj.) J. Taylor; Capt. D. Thomson; Lt.-Col. J. Tidbury; Maj. (acting Lt.-Col.) H. W. M. Tims; Lt.-Col. F. S. Toogood; Temp. Lt.-Col. P. C. E. Trebe; Temp. Capt. and Bt. Maj. W. J. Tulloch; Temp. Lt.-Col. W. J. N. Vincent; Temp. Capt. H. H. Weekes; Temp. Capt. (acting Lt.-Col.) C. J. West; Lt.-Col. R. M. West, D.S.O. (T.F.); Hon. Lt.-Col. E. W. White; Temp. Capt. E. U. Williams; Temp. Maj. S. W. Williams; Temp. Maj. J. C. Woods; Temp. Maj. S. W. Woollett; Maj. R. Worth; Temp. Capt. E. D. Wortley; Temp. Lieut.-Col. Wrangham; Maj. M. B. Wright; Temp. Maj. W. P. Yetts; Lt.-Col. J. R. Yourdi.

M.B.E.—Capt. (acting Maj.) C. Armstrong (S.R.); Capt. A. G. Atkinson (T.F.); Temp. Maj. A. E. Barnett (S.L.); Lt.-Col. P. B. Benthiff, R. Jersey Med. Corps; Maj. R. Brodie (T.F.); Temp. Capt. (acting Maj.) S. Brown; Capt. (acting Maj.) R. N. Butler (T.F.); Temp. Capt. J. B. Butler; Capt. (acting Maj.) C. H. Caldicott (T.F.); Capt. (acting Maj.) J. H. Crane (T.F.); Temp. Capt. J. C. Fergusson, M.C.; Capt. (acting Maj.) B. M. Footner (T.F.); Temp. Capt. A. Grant; Temp. Capt. W. Groome; Temp. Capt. W. J. Harris; Temp. Capt. R. Johnson; Temp. Lt.-Col. J. Keay; Temp. Capt. (acting Maj.) C. M. Kennedy; Lt.-Col. E. Quayle; Maj. and Bt. Lt.-Col. D. Rennet (T.F.); Capt. (acting Maj.) O. C. G. Shields; Capt. (acting Maj.) L. J. Spence; Capt. (temp. Maj.) W. E. Squire; Capt. H. V. Stanley, M.C.; Temp. Maj. A. Stodart-Walker; Capt. A. H. Thomas; Capt (acting Maj.) F. J. Thorne; Maj. H. S. Webb; Capt. C. R. Woodruff (T.F.).

Canadian Army Medical Corps.—C.B.E.—Col. J. G. Adami; Col. J. W. Bridges; Lt.-Col. E. R. Brown; Col. P. G. Goldsmith; Col. J. A. Hutchi-on; Temp. Col. W. McKeown; Col. H. M. Robertson. *O.B.E.*—Maj. S. G. Chown; Lt.-Col. C. E. C. Cole; Lt.-Col. H. C. S. Elliot; Maj. Sir A. MacPhail; Lt.-Col. E. G. Mason; Temp. Capt. (acting Maj.) J. J. Thomson; Lt.-Col. D. A. Whitton; Lt.-Col. R. E. Wodehouse. *M.B.E.*—Temp Capt. J. H. Slayter.

Australian Army Medical Corps.—K.B.E.—Col. (Hon. Surg.-Gen.) C. S. Ryan, C.B., C.M.G. *C.B.E.*—Col. R. J. Millard, C.M.G. *O.B.E.*—Maj. A. Cook; Lt.-Col. C. E. Dennis; Maj. N. M. Gibson; Maj. (temp. Lt.-Col.) L. W. Jeffries, D.S.O.; Lt.-Col. G. A. W. J. Knight; Maj. J. Macdonald; Lt.-Col. H. C. Taylor-Young.

New Zealand Army Medical Corps.—C.B.E.—Lt.-Col. H. T. D. Acland, C.M.G.; Lt.-Col. A. R. D. Carberry; Lt.-Col. A. R. Falconer; Lt.-Col. G. E. Gabites; Lt.-Col. J. P. D. Leahy; Lt.-Col. R. H. Makgill; Lt.-Col. J. H. G. Robertson. *O.B.E.*—Lt.-Col. P. O. Andrew; Maj. C. V. Baigent, M.B.; Lt.-Col. H. F. Bernau; Maj. F. T. Bowerbank; Maj. E. H. Colbeck; Capt. (temp. Maj.) D. E. Fenwick; Maj. G. E. O. Fenwick; Lt.-Col. A. W. Hogg; Maj. A. W. Izard; Lt.-Col. W. Little; Maj. E. L. Marchant; Maj. H. P. Pickerill. *M.B.E.*—Capt. D. N. Isaacs; Lt. W. Jack; Capt. E. C. Lowe; Maj. W. H. Pettit.

South African Army Medical Corps.—C.B.E.—Col. P. G. Stock. C.B. *O.B.E.*—Maj. H. C. Baker; Temp. Maj (acting Lt.-Col.) H. H. Balfour, M.B.E.; Temp. Lt.-Col. D. Horwich; Temp. Lt.-Col. R. Maxwell; Maj.

F. Napier; Temp. Lt.-Col. H. J. Orford; Capt. R. D. Parker; Temp. Lt.-Col. C. Porter; Maj. J. C. A. Rigby. *M.B.E.*—Capt. G. S. Coghlan.

To be Brevet Colonel.—Temp. Lt.-Col. J. W. Alexander, D.S.O. (T.F. Res.); Lt.-Col. (acting Col.) J. C. Connor, C.M.G.; Lt.-Col. T. H. Corkery, Ret. Pay, late R.A.M.C.; Lt.-Col. (acting Col.) C. T. Green (T.F.); Lt.-Col. W. Howorth (T.F.); Lt.-Col. H. Littlewood, C.M.G. (T.F.); Surg. Lt.-Col. P. H. Whiston, Ret. Pay, late I. Gds.

To be Brevet Lieutenant-Colonel.—Maj. (temp. Lt.-Col.) F. J. Brown (R. of O.), late R.A.M.C.; Maj. A. J. Chambers (R. of O.), late R.A.M.C.; Maj. W. McA. Eccles (T.F.); Temp. Maj. S. Fleming; Maj. B. F. Hamilton, late R.A.M.C.; Maj. R. W. W. Henry (T.F.); Temp. Maj. L. E. Lanyon-Owen; Maj. H. A. Leebody (T.F.); Maj. (acting Lt.-Col.) E. J. Maclean (T.F.); Temp. Maj. A. W. Robertson; Maj. H. Skelding (T.F.); Maj. W. C. Smales, D.S.O.; Temp. Maj. T. R. St. Johnston; Maj. W. A. Stott, attd. R.A.M.C.; Maj. (acting Lt.-Col.) R. T. Turner (T.F.); Maj. Sir H. F. Waterhouse, Kt. (T.F.); Maj. M. G. Pearson, O.B.E., S. Afr. M.C.; Temp. Maj. T. L. L. Sandes, O.B.E., S. Afr. M.C.

To be Brevet Major.—Capt. W. Brander (T.F. Res.); Capt. (acting Maj. W. R. Bristow (T.F.); Capt. H. C. Dent (R. of O.), A.M.S.; Capt. H. S. Dickson; Temp. Capt. J. S. Dunn; Capt. (acting Maj.) C. M. Fegen (T.F.); Temp. Capt. (acting Maj.) W. Fell; Temp. Capt. A. E. Giles; Capt. A. W. Howlett; Capt. G. H. Hunt (T.F.); Capt. R. A. Peters, M.C. (S.R.); Temp. Capt. (acting Maj.) W. E. P. Phillips; Temp. Capt. W. B. Purchase, M.C.; Capt. (acting Maj.) B. Shires (S.R.); Temp. Capt. W. S. Stalker; Capt. E. S. Winter (T.F.).

Royal Air Force.

O.B.E.—Capt. (acting Maj.) M. R. Dobson; Maj. A. H. Hogarth, D.C.M.; Capt. (acting Maj.) T. S. Rippon.

M.B.E.—Capt. E. P. Carmody; Capt. J. Chambré; Capt. A. G. H. Smart.

India.

O.B.E.—Dr. C. H. Elmes, Officiating Health Officer, Port of Calcutta, Bengal; Major C. A. F. Hingston, I.M.S., Personal Assistant to the Surgeon-General with the Government of Madras; Dr. C. S. G. Myires, American Mission, Koweit, Persian Gulf; Lt.-Col. E. J. O'Meara, I.M.S., Principal Medical School, Agra, United Provinces.

M.B.E.—Hon. Capt. R. T. Rodgers, Ind. Med. Dep., Superintendent, Central Jail, Jubbulpore, Central Provinces.

Kaisar-i-Hind Medal.—Lt.-Col. R. H. Castor, I.M.S., Civil Surgeon, Moulmein, Burma; Dr. C. C. Caleb, Professor of Physiology, King Edward Memorial College, Lahore; Dr. H. G. Roberts, Officiating Civil Surgeon, Shillong, Assam.

I.S.O.—Hon. Maj. J. Robertson, Ind. Med. Dep., in charge of Viceroy's Dispensary.

France and Flanders.

K.C.B.—Temp. Maj.-Gen. Sir A. A. Bowlby, K.C.M.G., K.C.V.O., C.B.

K.C.M.G.—Temp. Col. W. T. Lister, C.M.G.; Temp. Maj.-Gen. C. S. Wallace, C.B., C.M.G.; Maj.-Gen. H. N. Thompson, C.B., C.M.G., D.S.O.; Temp. Maj.-Gen. Sir W. P. Herringham, C.B.

K.B.E.—Maj. (temp. Col.) H. A. Ballance, C.B., R.A.M.C. (T.F.); Col. R. H. Firth, C.B., A.M.S.

C.B.—Temp. Col. W. Taylor.

C.B.E.—Col. J. D. Alexander, D.S.O., late R.A.M.C.; Col. F. W. Begbie, late R.A.M.C.; Col. W. W. O. Beveridge, C.B., D.S.O., late R.A.M.C.; Lt.-Col. (temp. Col.) A. W. N. Bowen, D.S.O.; Maj. (temp. Maj.-Gen.) Sir J. R. Bradford, K.C.M.G., C.B. (T.F.); Temp. Maj. and Acting Lt.-Col. W. P. S. Branson; Lt.-Col. (temp. Col.) B. B. Burke, D.S.O.; Capt. (temp. Col.) H. Burrows, O.B.E. (T.F.), Lt.-Col. and Bt.-Col. J. P. Bush, C.M.G. (T.F.); Lt.-Col. E. M. Callender (T.F.); Lt.-Col. (temp. Col.) J. H. Campbell, D.S.O.; Lt.-Col. (temp. Col.) J. Clay (T.F.); Temp. Maj. (acting Lt.-Col.) R. H. Cooper; Lt.-Col. and Bt.-Col. W. L'E. Eames, C.B.; Temp. Col. T. R. Elliott, D.S.O., A.M.S.; Lt.-Col. (acting Col.) O. W. A. Eisner, D.S.O.; Capt. and Bt. Maj. (acting Col.) C. H. S. Frankau, D.S.O. (T.F.); Lt.-Col. (temp. Col.) T. Fraser, D.S.O. (T.F.); Temp. Capt. (acting Lt.-Col.) F. Fraser; Col. T. W. Gibbard, C.B., K.H.S., late R.A.M.C.; Lt.-Col. (acting Col.) G. M. Goldsmith; Col. H. W. Grattan, D.S.O., late R.A.M.C.; Maj. (temp. Lt.-Col.) A. M. H. Gray; Maj. (acting Lt.-Col.) J. R. Harper (T.F.); Lt.-Col. E. C. Hayes; Lt.-Col. F. W. Higgs (T.F.); Temp. Lt.-Col. G. M. Holmes, C.M.G.; Lt.-Col. (acting Col.) C. H. Howkins, D.S.O. (T.F.); Col. W. E. Hudleston, C.M.G., D.S.O., late R.A.M.C.; Lt.-Col. (temp. Col.) D. O. Hyde, D.S.O.; Maj. and Bt. Lt.-Col. (temp. Lt.-Col.) G. S. Jackson, D.S.O.; Temp. Col. F. Kelly (T.F.); Temp. Capt. (acting Maj.) E. C. Lindsay; Maj. (acting Lt.-Col.) H. MacCormac; Lt.-Col. (acting Col.) MacLaughlin; Col. R. L. R. Macleod, C.B.; Temp. Maj. (temp. Col.) C. H. Miller; Col. F. J. Morgan, C.M.G., late R.A.M.C.; Col. E. M. Pilcher, C.B., D.S.O., late R.A.M.C.; Lt.-Col. (Temp. Col.) C. E. Pollock, D.S.O.; Col. H. V. Prynne, D.S.O., late R.A.M.C.; Capt. (acting Maj.) C. F. M. Saint (T.F.); Lt.-Col. (temp. Col.) J. P. Silver, D.S.O.; Temp. Maj. F. N. G. Starr; Col. J. C. B. Statham, C.M.G., late R.A.M.C.; Col. H. S. Thurston, C.B., C.M.G., late R.A.M.C.; Temp. Col. A. E. Webb Johnson, D.S.O.; Lt.-Col. and Bt. Col. F. H. Westmacott (T.F.); Lt.-Col. (temp. Col.) E. A. Wraith, D.S.O. (T.F.).

O.B.E.—Temp. Capt. F. J. Allen, M.C.; Temp Capt. (acting Maj.) W. Anderson; Temp. Capt. (acting Maj.) W. B. G. Augus, M.C.; Capt. (acting Maj.) S. R. Armstrong (S.R.); Temp. Capt. E. F. Bashford; Capt. (acting Maj.) H. T. Bates (T.F.) Capt. H. C. Bazett, M.C.; Lt. Col. (temp. Col.) W. Bennett, D.S.O.; Temp. Maj. G. A. Benson, D.C.M. (R. of O.); Temp. Capt. G. W. Beresford; Capt. (acting Maj.) W. S. S. Berry; Capt. and Bt. Maj. (acting Lt.-Col.) H. H. Blake; Temp. Capt. (acting Maj.) L. R. Broster; Capt. (acting Lt.-Col.) J. Bruce (T.F.); Maj. (acting Lt.-Col.) J. C. G. Carmichael; Maj. (acting Lt.-Col.) T. M. Carter (T.F.); Maj. R. C. Clarke (T.F.); Temp. Capt. C. G. Colyer; Maj. D. M. Corbett; Temp. and Hon. Maj. H. G. Crabtree; Temp. Capt. J. G. Craig; Maj. (acting Lt.-Col.) J. M. M. Crawford; Maj. J. F. Cunningham; Capt. (acting Maj.) J. Dale (T.F.); Temp. Capt. (acting Lt.-Col.) H. S. Davidson; Maj. (acting Lt.-Col.) G. De La Cour; Capt. (acting Maj.) R. F. O'T. Dickinson; Capt. (acting Maj.) R. A. Dixon (T.F.); Temp. Capt. R. S. Dobbin; Capt. (acting Maj.) A. W. H. Donaldson (T.F.); Maj. J. H. Douglas; Temp. Hon. Lt.-Col. G. Dreyer; Temp. Capt. J. D. Driberg, M.C.; Temp. Capt. C. E. Dukes; Maj. J. M. Duncan (T.F.); Capt. (acting Lt.-Col.) W. Duncan (T.F.); Maj. J. Everidge (T.F.); Capt. M. du B. Ferguson; Capt. C. Forbes (T.F.); Temp. and Hon. Maj. K. Foster; Maj. M. G. Foster (T.F.); Capt. (acting Maj.) T. L. Fraser; Temp. Capt. (acting Maj.) H. W. Gabe; Capt. (acting Maj.) G. F. P. Gibbons (S.R.); Capt. (acting Maj.) A. J. Gilchrist, M.C.; Capt. H. J. Gordle (T.F.); Temp. Capt. C. B. Goulden; Maj. (acting Lt.-Col.) D. J. Graham (T.F.); Maj. (acting Lt.-Col.) A. C. H. Gray; Lt.-Col. A. G. Hamilton (T.F.); Temp. Capt. J. N. J. Hartley; Maj. A. H. Heslop, D.S.O.; Capt. (acting Maj.) T. T. Higgins; Temp. Maj. C. W. M. Hope; Maj. (acting Lt.-Col.) F. W. Jonnson (T.F.); Temp. Capt. (acting Maj.) F. P. Josselyne, M.C.; Capt. C. King; Capt. (acting Lt.-Col.) E. Knight (T.F.); Temp. Maj. L. F. Knuthsen; Maj. (acting Lt.-Col.) R. W. D. Leslie; Temp. Capt. T. P. Lewis; Temp. Capt. W. S. Lindsay; Temp. Capt. N. P. L. Lumb; Temp. Capt. F. C. MacDonald; Temp. Capt. W. MacEwen; Capt. (acting Maj.) R. B. MacFie; Temp. Capt. (acting Maj.) C. MacKenzie; Capt. (acting Maj.) D. M. Marr (S.R.); Temp. Capt. O. de B. Marsh; Capt. (acting Maj.) G. Marshall (S.R.); Maj. I. C. Marshall (T.F.); Maj. C. J. Martin (T.F.); Maj. S. Martyn (T.F.); Temp. Capt. (acting Maj.) R. Massie; Temp. Capt. O. S. Maunsell; Temp. Capt. E. T. C. Milligan; Capt. (acting Lt.-Col.) H. G. Monteith, D.S.O.; Capt. (acting Maj.) J. Y. Moore; Temp. Capt. R. F. Moore; Temp Capt. J. T. Morrison; Temp. Capt. (acting Maj.) F. H. Moxon; Temp. Capt. G. L. Neil; Maj. (acting Lt.-Col.) R. E. U. Newman, M.C.; Hon. Lt.-Col. E. H. Nicholas; Temp. Maj. M. W. B. Oliver; Capt. T. M. Ormiston (T.F.); Temp. Capt. A. C. Palmer; Capt. (acting Maj.) M. W. Paterson, M.C. (S.R.); Capt. H. M. J. Perry; Capt. (acting Maj.) W. de M. Peyton; Capt. (acting Maj.) W. R. Pierce (T.F.); Temp. Capt. A. E. Pinniger; Temp. Capt. W. A. Rees; Maj. J. D. Richmond, D.S.O.; Maj. M. B. H. Ritchie, D.S.O.; Capt. (acting Maj.) R. L. Ritchie; Temp. Capt. (acting Maj.) J. E. H. Roberts; Capt. (acting Maj.) A. L. Robertson; Temp. Capt. R. C. Robertson; Maj. (acting Lt.-Col.) H. B. Roderick (T.F.); Capt. (acting Maj.) H. D. Rollinson (S.R.); Capt. W. J. Ronan; Capt. (acting Maj.) W. H. Rowell (T.F.); Capt. (acting Lt.-Col.) P. T. Rutherford (T.F.); Temp. Capt. (acting Maj.) H. H. Sampson M.C.; Temp. Capt. (acting Maj.) H. W. Scawin; Capt. (acting Lt.-Col.) D. J. Scott, M.C. (T.F.); Temp. Capt. (acting Maj.) E. J. Selby; Temp. Capt. H. P. Shackleton; Lt.-Col. G. C. E. Simpson (T.F.); Lt.-Col. (acting Col.) H. Simson; Capt. (acting Maj.) G. W. Smith; Lt.-Col. S. B. Smith, D.S.O.; Capt. R. S. S. Statham; Lt.-Col. G. N. Stephen; Capt. (acting Maj.) G. H. Stevenson, M.C. (S.R.); Capt. R. W. E. Stickings, (T.F.); Temp. Capt. W. Stirling; Capt. (acting Maj.) W. Stobie (T.F.); Temp. Capt. A. Stokes, D.S.O.; temp. Capt. (acting Lt.-Col.) H. Stokes; Temp. Capt. E. J. Stuckey; Capt. (acting Maj.) R. W. Swayne (T.F.); Temp. Capt. (acting Maj.) D. C. Taylor; Temp. Capt. (acting Maj.) S. S. Taylor (T.F.); Temp. Maj. G. Taylor; Temp. Capt. A. T. Todd; Capt. (acting Maj.) L. R. Tosswill (T.F.); Temp. Capt. (acting Maj.) P. N. Vellacott; Temp. Capt. C. W. Wanklyn-James; Maj. (acting Lt.-Col.) W. J. Waters; Temp. Capt. (acting Maj.) F. W. Wesley; Maj. C. F. White; Temp. Capt. M. H. Whiting; Capt. (acting Maj.) K. D. Wilkinson (T.F.); Capt. (acting Maj.) A. Wilson, M.C. (S.R.); Temp. Capt. J. A. Wilson; Temp. Capt. F. A. Winder; Temp. Capt. (acting Maj.) F. B. Winfield; Capt. (acting Maj.) J. L. Wood; Temp. Capt. H. Yellowlees.

Canadian Army Medical Corps.—*C.B.E.*—Lt.-Col. E. V. Hogan; Lt.-Col. (acting Col.) C. P. Templeton, D.S.O.; Lt.-Col. F. W. E. Wilson. *O.B.E.*—Lt.-Col. A. E. K. Bennett; Maj. A. W. M. Ellis; Maj. A. L. Jones, M.C.; Maj. L. F. Jones; Maj. A. F. Macaulay; Capt. J. F. S. Marshall, M.C.; Capt. H. W. Martin; Lt.-Col. C. H. Reason, D.S.O.; Capt. W. A. Richardson; Maj. R. B. Robertson; Maj. P. D. Stewart; Maj. S. J. Streight; Lt.-Col. F. A. Young.

Australian Army Medical Corps.—*O.B.E.*—Capt. G. Bell; Capt. (Temp. Maj.) J. W. Farrar; Lt.-Col. P. Flaschi; Maj. F. D. H. B. Lawton; Lt.-Col. V. O. Stacy.

South African Army Medical Corps.—*O.B.E.*—Lt.-Col. G. H. Usmar.

To be Lieutenant-General.—Maj.-Gen. (temp. Lt.-Gen.) C. H. Burtchaell, K.C.B., C.M.G., K.H.S.

To be Major-General.—Col. (temp. Maj.-Gen.) S. G. Moores, C.B., C.M.G., late R.A.M.C.

To be Hon. Major-General on retirement.—Col. (temp. Maj.-Gen.) Sir J. M. Irwin, K.C.M.G., C.B., ret. pay, late R.A.M.C.

To be Brevet Colonel.—Lt.-Col. (acting Col.) W. R. Blackwell, C.M.G.; Lt.-Col. (acting Col.) C. R. Evans, D.S.O.; Lt.-Col. (temp. Col.) H. B. Fawcus, C.M.G., D.S.O.; Lt.-Col. (temp. Col.) J. S. Gaille, C.M.G., D.S.O.; Lt.-Col. (acting Col.) W. H. P. Goodwin, D.S.O.; Lt.-Col. (temp. Col.) J. A. Hartigan, C.M.G., D.S.O.; Lt.-Col. (temp. Col.) L. Humphry, C.M.G.; Lt.-Col. (temp. Col.) T. C. Mackenzie, D.S.O.; Lt.-Col. (acting Col.) F. McLennan, D.S.O.; Lt.-Col. (temp. Col.) J. Powell, D.S.O.; Lt.-Col. (acting Col.) W. Riach, C.M.G.; Lt.-Col. (temp. Col.) A. H. Safford.

To be Brevet Lieutenant-Colonel.—Maj. (acting Lt.-Col.) R. B. Ainsworth, D.S.O.; Maj. (acting Lt.-Col.) T. S. Coates, O.B.E.; Maj (temp. Lt.-Col.) F. D. G. Howell, D.S.O., M.C.; Maj. (acting Lt.-Col.) W. F. Tyndale, C.M.G., D.S.O.

To be Brevet Major.—Capt. (acting Maj.) T. H. Balfour, M.C.; Capt. (acting Lt.-Col.) J. D. Bowie, D.S.O.; Capt. (acting Maj.) R. Gale, D.S.O.; Temp. Capt. R. McC. Hill, D.S.O., Capt. (acting Maj.) F. R. Laing.

D.S.O.—Capt. (acting Lt.-Col.) H. N. Burroughes (T.F.); Temp. Capt. G. de H. Dawson; Maj. (acting Lt.-Col.) C. M. Drew; Lt.-Col. A. D. Ducat; Maj. A. H. Falkner (T.F.); Capt. (acting Lt.-Col.) J. H. P. Fraser, M.C. (T.F.); Capt. (acting Lt.-Col.) R. W. Galloway; Capt (acting Lt.-Col.) I. R. Hudleston; Capt. (acting Lt.-Col.) G. K. Maurice (T.F.); Capt. (acting Lt.-Col.) A. C. H. McCullagh (T.F.); Capt. (acting Lt.-Col.) J. Miller, M.C. (T.F.); Maj (acting Lt.-Col.) D. de C. O'Grady; Capt. (acting Lt.-Col.) E. Phillips, M.C.; Capt. (acting Lt.-Col) J. W. C. Stubbs, M.C.; Capt. (acting Lt.-Col.) L. F. K. Way.

Canadian Army Medical Corps.—Maj. (acting Lt.-Col.) R. H. M. Hardisty, M.C.; Lt.-Col. R. H. Macdonald, M.C.; Maj. (acting Lt.-Col.) E. R. Selby.

Australian Army Medical Corps.—Lt.-Col. H. B. Lewers, O.B.E.; Maj. (temp. Lt.-Col.) J. R. Muirhead; Maj. M. V. Southey; Lt.-Col. C. W. Thompson; Lt.-Col. F. C. Wooster.

New Zealand Army Medical Corps.—Maj. (temp. Lt.-Col.) P. J. Jory.

Bar to Military Cross.—Capt. (acting Maj.) H. J. Milligan, M.C. (T.F.).

Military Cross.—Temp. Capt. R. B Carter; Capt. W. K. Churchhouse (T.F.); Temp. Capt. H. S. Collier; Temp. Capt. (acting Maj.) W. Crabtree; Temp. Capt. M. E. Dalfield; Temp. Capt. (acting Maj.) J. S. Doyle; Capt. (acting Maj.) A. E. Drynan; Capt. (acting

Maj.) A. J. Dunlop; Temp. Capt. G. E. Elkington; Temp. Capt. G. J. Fairie; Capt. (acting Maj.) W. P. Ferguson (T.F.); Temp. Capt. J. B. Galligan; Capt. D. G. Gardiner; Capt. (acting Maj.) A. M. Gibson (T.F.); Temp. Capt. J. Graham; Capt. A. G. P. Hardwick; Temp. Capt. J. L. Hendry; Temp. Capt. G. A. Hodges; Capt. (acting Maj.) A. M. Hughes; Lt. A. Kennedy (S.R.); Temp. Capt. H. T. Lippiatt; Temp. Capt. J. B. McCabe; Temp. Capt. R. MacGill; Capt. (acting Maj.) T. B. McKee; Temp. Capt. J. McMillan; Temp. Capt. D. Malloch; Temp. Capt. (acting Maj.) A. Massey; Capt. O'C. O'Sullivan; Temp. Capt. W. L. Paterson; Temp. Capt. W. M. Penny; Capt. H. J. Rice; Temp. Capt. J. D. Robertson; Capt. (acting Maj.) J. F. W. Sandison (S.R.); Capt. (acting Maj.) S. Scott (T.F.); Temp. Capt. (acting Maj.) A. H. Spicer; Temp. Capt. R. H. Thomson; Temp. Capt. E. M. Townsend; Temp. Capt. (acting Maj.) H. W. Turner; Temp. Capt. (acting Maj.) A. S. Wakely; Capt. G. S. Williamson (T.F.).

Canadian Army Medical Corps.—Capt. T. D. Bennett; Capt. H. C. Hall; Capt. A. H. Veitch.

Australian Army Medical Corps.—Capt. D. H. Bodycomb; Capt. A. S. Cockburn.

Italy.

K.C.M.G.—Maj.-Gen. F. R. Newland, C.B., C.M.G.

K.B.E.—Temp. Col. C. G. Watson, C.M.G., A.M.S.

C.B.E.—Lt.-Col. (temp. Col.) J. C. Robertson, C.M.G., C.I.E., I.M.S.

O.B.E.—Maj. (acting Lt.-Col.) C. Bramhall; Capt. (acting Maj.) M. Coplans, D.S.O. (T.F.); Temp. Capt. (temp. Lt.-Col.) E. A. Gates; Maj. (acting Lt.-Col.) T. H. Gibbon; Capt. (acting Lt.-Col.) J. G. Gill, D.S.O., M.C.; Temp. Capt. J. Jardine; Temp. Capt. (acting Maj.) R. H. Lucas, M.C.

D.S.O.—Capt. (temp. Maj.) C. J. O'Reilly, M.C.; Temp. Capt. A. E. Thompson, M.C.; Capt. (acting Lt.-Col.) E. W. Vaughan, M.C.

Military Cross.—Capt. L. Ball (T.F.); Temp. Capt. J. B. Matthews (T.F.).

Egypt.

K.C.M.G.—Col. (temp. Maj.-Gen.) R. H. Luce, C.B., C.M.G., A.M.S.

C.B.E.—Temp. Lt.-Col. J. J. Abraham, D.S.O.; Maj. and Bt. Lt.-Col. (temp. Lt.-Col.) H. V. Bagshawe, D.S.O.; Col. T. B. Beach, C.M.G., A.M.S.; Temp. Col. J. M. Cowan, A.M.S.

O.B.E.—Capt. (acting Maj.) J. A. H. Aitkin (T.F.); Capt. C. H. Allen (T.F.); Capt. (acting Maj.) F. A. Barker, I.M.S.; Temp. Capt. (acting Maj.) M. Bates; Capt. (acting Maj.) J. J. B. Biggs (T.F.); Maj. J. M. G. Bremner (T.F.); Temp. Capt. A. Brown; Capt. (acting Lt.-Col.) W. Brown (T.F.); Capt. C. C. Chesterman; Temp. Capt. C. McK. Craig; Temp. Capt. N. G. W. Davidson; Capt. (acting Maj.) H. J. Dunbar (T.F.); Temp. Maj. A. R. Ferguson; Maj. W. H. Fisher (T.F.); Capt. W. T. Graham; Temp. Capt. A. Grant; Capt. W. F. T. Haultain, M.C. (S.R.); Maj. (temp. Lt.-Col.) G. W. Heron, D.S.O.; Capt. (acting Maj.) M. J. Holgate, I.M.S.; Temp. Capt. W. C. Jardine; Maj. (acting Lt.-Col.) S. W. Jones, I.M.S.; Capt. (acting Maj.) C. Kerr (T.F.); Temp. Capt. (acting Maj.) R. E. H. Leach; Temp. Capt. G. L. Leggat; Capt. H. R. L'Estrange; Capt. G. J. Linklater (T.F.); Temp. Capt. P. Lornie; Temp. Capt. R. MacDonald; Capt. and Bt. Maj. A. S. M. MacGregor (T.F.); Temp. Capt. R. C. Malhotra, I.M.S.; Capt. (acting Maj.) W. Mathieson; Capt. (acting Lt.-Col.) E. M. Middleton; Lt.-Col. C. Milne, I.M.S.; Maj. (acting Lt.-Col.) A. W. Moore (T.F.); Temp. Capt. G. C. Neilson; Capt. (acting Maj.) R. Phillips (T.F.); Capt. (acting Lt.-Col.) J. R. Pooler (T.F.); Capt. (temp. Maj.) F. P. Rankin; Temp. Capt. (acting Maj.) A. E. Rayner; Capt. G. R. Rickett (T.F.); Capt. (acting Maj.) W. T. Ritchie (T.F.); Capt. A. Robertson (T.F.); Temp. Capt. J. W. Robertson; Maj. (acting Lt.-Col.) J. W. S. Seccombe; Capt. H. S. C. Starkey (T.F.); Lt.-Col. G. H. Stewart, I.M.S.; Capt. (acting Maj.) J. Strathearn (T.F.); Temp. Capt. (acting Maj.) R. H. Strong; Temp. Capt. J. R. K. Thomson; Temp. Capt. E. Thorp; Capt. (temp. Maj.) W. W. Treves; Maj. (acting Lt.-Col.) J. J. Urwin, I.M.S.; Capt. R. Verel (T.F.); Temp. Maj. F. M. R. Walshe; Maj. (acting Lt.-Col.) N. S. Wells, I.M.S.; Maj. (acting Lt.-Col.) M. F. White, I.M.S.; Temp. Capt. E. W. G. Young, M.C.

M.B.E.—Temp. Lt. J. A. Anastasie.

Australian Army Medical Corps.—*C.B.E.*—Lt.-Col. (temp. Col.) D. G. Croll. *O.B.E.*—Maj. A. M. Davidson; Lt.-Col. A. J. H. Saw; Col. W. E. Summons.

To be Brevet Colonel.—Lt.-Col. (temp. Col.) W. H. Ogilvie, C.M.G., I.M.S.

To be Brevet Lieutenant-Colonel.—Maj. (acting Lt.-Col.) J. M. H. Conway, D.S.O.; Maj. (acting Lt.-Col.) W. F. Ellis, O.B.E.; Maj. (acting Lt.-Col.) J. L. Lunham, I.M.S.

To be Brevet Major.—Capt. (acting Maj.) W. C. Paton, M.C., I.M.S.; Temp. Capt. E. C. Williams.

D.S.O.—Maj. (acting Lt.-Col.) S. H. L. Abbott, I.M.S.; Maj. and Bt. Lt.-Col. (acting Lt.-Col.) H. M. H. Melhuish, I.M.S.; Maj. (acting Lt.-Col.) H. T. Samuel (T.F.); Lt.-Col. G. E. M. Stuart.

Military Cross.—Capt. (acting Maj.) A. R. F. Clarke (S.R.); Temp. Capt. Mohammad Salamat Ullah, I.M.S.; Capt. J. Walker (T.F.); Capt. G. H. H. Waylen (T.F.).

Mesopotamia.

C.B.E.—Lt.-Col. (temp. Col.) H. M. Morton, D.S.O.

O.B.E.—Capt. J. M. H. Campbell (S.R.); Capt. W. Corner (S.R.); Maj. (temp. Lt.-Col.) H. M. Cruddas, C.M.G., I.M.S.; Capt. and Bt. Maj. L. Dunbar; Capt. (acting Lt.-Col.) W. J. Dunn; Lt.-Col. J. G. Foster; Lt.-Col. F. E. Fremantle (T.F.); Capt. H. L. Garson, M.C.; Lt. (temp. Capt.) O. D. Jarvis; Capt. J. C. John, I.M.S.; Capt. (acting Maj.) D. H. C. MacArthur; Temp. Capt. A. MacMillan; Capt. and Bt. Maj. W. McNaughtan; Capt. J. B. de W. Molony, I.M.S.; Maj. E. B. Munro, I.M.S.; Temp. Capt. S. Murray; Maj. H. W. Russell; Temp. Maj. (acting Lt.-Col.) E. W. Skinner; Lt. (temp. Capt.) J. S. Sloper; Capt. (acting Maj.) E. P. A. Smith, M.C.; Temp. Capt. C. R. Taylor; Maj. N. D. Walker; Capt. W. L. Watson, I.M.S.; Maj. (acting Lt.-Col.) J. F. Whelan, D.S.O.; Maj. V. N. Whitamore, I.M.S.; Capt. (acting Maj.) W. E. R. Williams, I.M.S.

To be Brevet Lieutenant-Colonel.—Maj. (acting Lt.-Col.) F. P. Connor, D.S.O., I.M.S.; Maj. (acting Lt.-Col.) R. Griffith (T.F.); Maj. (acting Lt.-Col.) R. A. Lloyd, D.S.O., I.M.S.; Maj. (acting Lt.-Col.) A. W. Sampey.

To be Brevet Major.—Capt. (acting Maj.) M. Purvis, I.M.S.; Capt. (temp. Maj.) H. C. Todd.

South Africa.

O.B.E.—Lt.-Col. C. F. K. Murray, District Brigade Surgeon, St. John Ambulance, Capetown.

East Africa.

O.B.E.—Capt. H. L. Duke, Uganda, M.S.; Capt. (acting Maj.) S. J. V. Furlong (S.R.); Capt. (acting Lt.-Col.) J. D. Kidd, M.C.

M.B.E.—Temp. Capt. G. G. Butler; Temp. Capt. A. Crawford; Capt. J. I. Greig; Temp. Capt. (acting Maj.) H. F. Mullan; Lt. J. (Prince) Mussanji Walugembe, Afr. Nat. Med. Cps.; Temp. Capt. E. J. J. Quirk, W. Afr. Med. Serv.; Temp. Capt. J. B. Wilkie.

South African Army Medical Corps.—*O.B.E.*—Maj. (temp. Lt.-Col.) W. V. Field; Temp. Lt.-Col. J. Grinsell. *M.B.E.*—Capt. R. D. A. Douglas; Capt. S. M. McPherson.

To be Brevet Major.—Capt. (acting Lt.-Col.) T. A. Weston.

Balkans.

C.B.E.—Temp. Col. L. S. Dudgeon, C.M.G., A.M.S.; Temp. Lt.-Col. A. W. Falconer, D.S.O. (T.F.); Capt. (temp. Lt.-Col.) E. G. Gauntlett, D.S.O. (T.F.); Temp. Lt.-Col. C. M. Wenyon, C.M.G.; Capt. (temp. Maj.) A. S. Cane; Temp. Capt. T. D. Cumberland; Dr. Elsie J. Dalyell; Capt. H. A. T. Fairbank, D.S.O.; Capt. C. E. C. Ferry (T.F.); Capt. T. S. Hele (T.F.); Lt.-Col. H. E. R. James, C.B., C.M.G.; Temp. Capt. (acting Maj.) J. A. Jones; Maj. (temp. Lt.-Col.) A. E. Kidd (T.F.); Dr. Elizabeth H. Lepper; Temp. Capt. (acting Lt.-Col) R. P. Nash (T.F.); Temp. Capt. F. Newey (T.F.); Temp. Capt. J. R. Stott; Capt. (acting Maj.) R. M. Vick (T.F.); Temp. Capt. J. Warnock; Temp. Maj. H. W. Wiltshire, D.S.O.; Capt. (acting Maj.) L. D. Woods; Temp. Capt. F. H. Young;

To be Brevet Major.—Capt. (acting Maj.) N. V. Lothian, M.C.; Capt. J. A. Sinton, V.C., I.M.S.

D.S.O.—Capt. and Bt. Maj. (acting Lt.-Col.) P. S. Tomlinson.

Military Cross.—Temp. Capt. O. A. Beaumont; Temp. Capt. (acting Maj.) R. K. Birnie; Temp. Capt. (acting Maj.) W. V. Macaskie; Capt. A. C. Macdonald (S.R.).

Russia.

O.B.E.—Capt. (acting Maj.) W. N. W. Kennedy (T.F.); Lt.-Col. T. McDermott; Capt. J. Renwick.

M.B.E.—Lt. F. Evans (T.F.).

To be Brevet Major.—Capt. H. Brian-Pearson (T.F.).

Aden Peninsula.

O.B.E.—Maj. (temp. Lt.-Col.) I. M. Macrae, I.M.S.

MENTIONED IN DESPATCHES.

The names of the following medical officers and others are mentioned in despatches received from the officers commanding in the several sphere of operations detailed:—

Italy.

R.A.M.C.—Capt. (acting Lt.-Col.) J. J. H. Beckton; Capt. K. S. Beken (T.F.); Maj. and Bt. Lt.-Col. (temp. Lt.-Col.) J. G. Bell, D.S.O.; Maj. (acting Lt.-Col.) C. Bramhall; Capt. W. Broughton-Alcock (S.R.); Capt. (acting Maj.) H. H. Brown (S.R.); Temp. Capt. R. V. Dolbey; Lt.-Col. M. W. Falkner; Capt. H. P. Gabb, M.C. (S.R.); Temp. Capt. (acting Lt.-Col.) E. A. Gates; Maj. (acting Lt.-Col.) T. H. Gibbon; Capt. (acting Lt.-Col.) J. G. Gill, D.S.O., M.C.; Maj. (temp. Lt.-Col.) G. H. L. Hammerton, C.M.G., D.S.O. (T.F.); Capt. (acting Maj.) C. E. K. Herapath, M.C. (T.F.); Temp. Capt. J. Jardine; Temp. Capt. (acting Maj.) H. R. Macintyre, D.S.O., M.C.; Temp. Capt. S. Marle; Temp. Capt. K. D. Melville; Temp. Capt. (acting Maj.) R. Millar; Capt. (acting Lt.-Col.) P. Moxey (T.F.); Capt. (Temp. Maj.) C. J. O'Reilly, M.C.; Temp. Capt. W. Parker, M.C.; Temp. Capt. C. H. G. Prance; Temp. Lt.-Col. C. D. Pye-Smith, D.S.O., M.C.; Capt. C. C. Robinson (T.F.); Temp. Capt. A. E. Thompson, M.C.; Capt. (acting Lt.-Col.) E. W. Vaughan, M.C.; Temp. Capt. A. G. Wilson.

I.M.S.—Lt.-Col. (temp. Col.) J. C. Robertson, C.M.G., C.I.E.

A.M.S.—Col. S. A. Archer, C.M.G.; Lt.-Col. and Bt. Col. A. Chopping, C.M.G.; Capt. (acting Maj.) M. Coplans, D.S.O.; Col. J. V. Forrest, C.M.G.; Temp. Capt. (acting Maj.) R. H. Lucas, M.C.; Maj.-Gen. F. R. Newland, C.B., C.M.G.; Col. R. Pickard, C.M.G., T.D.; Temp. Capt. A. Shelley; Capt. (acting Maj.) T. O. Thompson; Temp. Col. C. G. Watson, C.M.G.; Col. T. du B. Whaite, C.M.G., A.M.S.; Capt. and Bt. Maj. (acting Col.) W. G. Wright, D.S.O.

British Red Cross Society.—Dr. D. L. Hubbard.

Egypt.

A.M.S. and R.A.M.C.—Temp. Maj. (acting Lt.-Col.) J. J. Abraham, D.S.O.; Maj. and Bt. Lt.-Col. (acting Lt.-Col.) H. V. Bagshawe, D.S.O.; Col. T. B. Beach, C.M.G.; Temp. Maj. G. F. Bird; Lt.-Col. (temp. Col.) E. B. Dowsett, D.S.O. (T.F.); Lt.-Col (temp. Col.) C. E. P. Fowler, O.B.E. (R. of O.); Lt.-Col. (temp. Col.) W. P. Gwynn; Maj. (acting Lt.-Col.) G. W. Heron, D.S.O.; Col. H. T. Knaggs, C.M.G.; Col. (temp. Maj.-Gen.) R. H. Luce, C.B., C.M.G., V.D. (T.F. Res.); Capt. and Bt. Maj. (temp. Maj.) A. S. M. Macgregor (T.F.); Capt. (acting Maj.) F. P. Rankin; Lt.-Col. (temp. Col.) E. P. Sewell, C.M.G., D.S.O.; Capt. (temp. Maj.) R. O. Sibley (T.F.); Lt.-Col. G. E. F. Stammers, O.B.E.; Capt. (acting Maj.) W. W. Treves; Capt. W. E. Adam, M.C.; Temp. Capt. W. R. Allen; Lt.-Col. W. L. Baker; Temp. Capt. (acting Maj.) M. Bates; Temp. Capt. J. B. Binns; Temp. Capt. J. T. Biesadell; Temp. Capt. C. H. B. Booth; Temp. Col. F. D. Boyd, C.M.G.; Temp. Hon. Capt. R. M. Bradley; Temp. Capt. F. Brickwell; Capt. E. A. P. Brock; Temp. Capt. A. Brown; Temp. Capt. W. T. Buchan; Temp. Capt. W. Campbell; Capt. E. Catford; Temp. Col. C. C. Choyce, C.B.E.; Temp. Capt. H. Christal; Temp. Capt. J. H. Cooke; Temp. Maj. W. E. M. Corbett; Temp. Capt. D. Corry; Temp. Col. J. M. Cowan; Temp. Capt. C. McK. Craig; Temp. Capt. N. G. W. Davidson; Temp. Maj. A. R. Ferguson; Temp. Capt. W. Forsyth; Temp. Capt. N. S. Gilchrist, O.B.E.; Temp. Lt.-Col. J. Godding, O.B.E., T.D.; Temp. Lt. E. Gofton; Capt. W. T. Graham; Temp. Capt. (acting Maj.) A. Grant; Temp. Capt. B. G. Gutteridge; Temp. Capt. J. R. Hewetson; Maj. (acting Lt.-Col.) A. B. Hinde; Temp. Capt. A. N. Hodges; Temp. Capt. W. C. Jardine; Temp. Capt. J. Jeffrey; Temp. Capt. R. M. Johnston; Temp. Capt. (acting Maj.) J. S. Joly; Temp. Capt. (acting Maj.) R. E. H. Leach; Temp. Capt. G. L. Leggat; Capt. H. R. L'Estrange; Temp. Capt. P. Lornie; Temp. Capt. R. Macdonald; Temp. Capt. (acting Maj.) A. T. Mackenzie; Capt. and Bt. Maj. (acting Maj.) W. E. Marshall, M.C.; Capt. F. W. Matheson; Capt. (acting Maj.) W. Mathieson; Temp. Capt. R. B. F. McKail; Capt. (acting Lt.-Col.) E. M. Middleton; Temp. Capt.

R. M. Morison; Temp. Capt. E. C. Myott; Temp. Capt. G. C. Neilson; Temp. Capt. H. North; Temp. Capt. (acting Maj.) A. R. Rayner; Temp. Capt. H. M. Reeve; Temp. Capt. (acting Maj.) J. M. Renton; Temp. Hon. Capt. B. McB. Richardson; Maj. (acting Lt.-Col.) F. E. Roberts, D.S.O.; Temp. Capt. J. W. Robertson; Temp. Capt. S. S. Rosebery; Temp. Capt. R. N. Salaman; Maj. (acting Lt.-Col.) J. W. S. Seccombe; Temp. Capt. J. D. G. Stewart; Temp. Capt. (acting Maj.) R. H. Strong; Temp. Capt. J. R. K. Thomson; Temp. Capt. E. Thorp; Temp. Col. H. Wade, D.S.O.; Temp. Maj. F. M. R. Walshe; Temp. Capt. (acting Maj.) G. B. Warburton; Temp. Capt. (acting Maj.) J. N. Wheeler; Temp. Capt. R. J. Wilson; Temp. Capt. J. Wright; Temp. Capt. H. D. Wyatt; Temp. Capt. E. W. G. Young, M.C.

R.A.M.C. (S.R.)—Capt. R. B. Campion; Capt. C. C. Chesterman; Capt. D. M. M. Fraser; Capt. W. F. T. Haultain, M.C.; Capt. T. P. Inglis; Capt. (temp. Lt.-Col.) P. S. Vickerman, O.B.E.; Capt. O. Williams.

R.A.M.C. (T.F.).—Capt. (acting Maj.) J. A. H. Aitken; Capt. C. H. Allen; Capt. (acting Lt.-Col.) H. S. Beadles; Capt. (acting Maj.) J. J. E. Biggs; Maj. J. M. G. Bremner; Capt. M. Brennan; Capt. (acting Lt.-Col.) W. Brown; Capt. M. T. G. Clegg; Capt. H. M. McC. Coombs; Capt. (acting Maj.) H. J. Dunbar; Maj. W. H. Fisher; Capt. (acting Maj.) W. T. Gardiner, M.C.; Capt. R. F. Gerrard; Capt. A. H. Hasnip; Capt. H. F. Humphreys, M.C.; Lt. H. Jessop; Capt. E. S. Johnson, M.C.; Capt. J. D. Jones; Capt. (acting Maj.) C. Kerr; Capt. G. J. Linklater; Maj. (acting Lt.-Col.) A. W. Moore; Capt. (acting Maj.) R. Phillips; Capt. (acting Lt.-Col.) J. R. Pooler; Capt. (acting Maj.) J. J. Rainforth; Capt. G. R. Rickett; Capt. (acting Maj.) W. T. Ritchie; Capt. A. Robertson; Capt. (acting Maj.) G. E. J. A. Robinson, M.C.; Maj. (acting Lt.-Col.) H. T. Samuel; Capt. (acting Maj.) W. Scott; Capt. (acting Maj.) A. L. Sharpin; Maj. A. B. Sloan; Capt. W. S. Soden; Capt. H. S. C. Starkey; Capt. (acting Maj.) J. Strathearn; Capt. W. T. Torrance; Capt. R. Verel; Maj. (acting Lt.-Col.) W. D. Watson; Capt. K. B. Williamson.

Australian Army Medical Corps.—Col. D. G. Croll; Maj. A. M. Davidson; Maj. G. Douglass; Col. R. M. Downes, C.M.G.; Maj. W. Evans, M.C.; Lt.-Col. (temp. Col.) R. Fowler, O.B.E.; Capt. F. G. Griffiths; Lt.-Col. W. L. Kirkwood; Capt. C. W. W. Murray; Lt.-Col. A. J. H. Saw; Maj. (temp. Lt.-Col.) C. V. Single; Maj. (temp. Lt.-Col.) G. E. M. Stuart; Col. W. E. Summons; Maj. E. B. M. Vance; Maj. M. Yuille.

New Zealand Army Medical Corps.—Capt. C. McB. Dawson; Maj. C. E. Hercus, D.S.O.

I.M.S.—Maj. (acting Lt.-Col.) S. H. L. Abbott; Capt. F. J. Anderson, M.C.; Capt. (acting Maj.) F. A. Barker; Capt. T. L. Bomford; Capt. H. H. Brown; Maj. and Bt. Lt.-Col. (temp. Col.) G. Browse, D.S.O.; Capt. (acting Maj.) M. J. Holgate; Maj. (acting Lt.-Col.) S. W. Jones; Maj. W. T. McCowen; Maj. (acting Lt.-Col.) E. C. G. Maddock; Maj. and Bt. Lt.-Col. (acting Lt.-Col.) H. M. H. Melhuish; Lt.-Col. C. Milne; Lt.-Col. (temp. Col.) W. H. Ogilvie, C.M.G.; Maj. (acting Lt.-Col.) J. C. S. Oxley; Capt. (acting Maj.) A. L. Sheppard; Lt.-Col. G. McI. C. Smith; Maj. (acting Lt.-Col.) G. H. Stewart; Maj. (acting Lt.-Col.) J. J. Urwin; Capt. R. L. Vance; Maj. (acting Lt.-Col.) N. S. Wells; Maj. R. T. Wells; Maj. (acting Lt.-Col.) M. F. White; Lt.-Col. and Bt. Col. (temp. Col.) W. W. White, C.B.; Temp. Capt. S. B. Gadgil; Temp. Lt. B. C. Ghosh; Temp. Capt. M. R. Grandhi; Temp. Capt. R. C. Malhoutra.

Royal Air Force.—Capt. J. Chambre.

Salonika.

R.A.M.C.—Temp. Capt. (acting Maj.) H. B. Atlee, M.C.; Temp. Capt. H. S. Banks; Temp. Capt. W. Barritt; Temp. Capt. O. A. Beaumont; Temp. Capt. (acting Maj.) R. K. Birnie; Temp. Capt. J. Brydon; Temp. Capt. (acting Maj.) S. Campbell; Capt. (acting Maj.) A. S. Cane; Temp. Capt. T. D. Cumberland; Temp. Capt. H. H. L. Ellison; Temp. Capt. R. R. Elworthy, O.B.E.; Temp. Capt. A. E. Fiddian; Temp. Capt. C. Y. Flewitt; Temp. Capt. (acting Maj.) W. Haward; Temp. Capt. H. E. Heapy; Temp. Capt. R. Heaton; Maj. and Bt. Lt.-Col. (acting Col.) C. W. Holden, D.S.O.; Temp. Capt. (acting Maj.) J. V. Holmes; Temp. Capt. G. P. B. Huddy; Temp. Capt. (acting Maj.) J. Hughston (died of wounds); Lt.-Col. H. E. R. James, C.B., C.M.G.; Temp. Capt. (acting Maj.) J. A. Jones; Temp. Capt. W. Landsborough; Capt. (acting Maj.) N. V. Lothian, M.C.; Temp. Capt. (acting Maj.) W. V. Macaskie; Temp. Capt. (acting Maj.) G. D. Mathewson; Capt. (acting Maj.) O. R. McEwen; Temp. Capt. H. L. Messenger; Temp. Capt. F. Newey; Lt.-Col. (temp. Col.) F. S. Penny, C.M.G., D.S.O.; Lt.-Col. G. B. Riddick; Maj. (acting Lt.-Col.) G. H. Stevenson, D.S.O.; Temp. Capt. J. R. Stott; Temp. Capt. E. R. Thompson; Capt. and Bt. Maj. (acting Lt.-Col.) P. S. Tomlinson; Temp. Capt. J. Warnock; Temp. Capt. L. T. Wells; Temp. Lt.-Col. C. M. Wenyon, C.M.G.; Temp. Capt. A. Wilkin; Temp. Capt. J. K. Willis; Temp. Maj. H. W. Wiltshire, D.S.O.; Temp. Capt. (acting Maj.) L. D. Woods; Temp. Capt. F. H. Young.

R.A.M.C. (S.R.).—Capt. A. La B. Clarke; Capt. G. Ewen; Capt. (acting Maj.) J. W. P. Harkness; Capt. A. C. MacDonald; Capt. W. McElroy; Capt. (acting Maj.) O. J. O'B. O'Hanlon; Capt. B. J. Ryrie; Capt. J. H. Sewart.

R.A.M.C. (T.F.).—Capt. J. A. Andrews; Capt. H. A. T. Fairbank, D.S.O.; Capt. (temp. Lt.-Col.) A. W. Falconer, D.S.O.; Capt. C. E. Ferrey; Capt. (temp. Lt.-Col.) E. G. Gauntlett, D.S.O.; Capt. T. S. Hele; Maj. (temp. Lt.-Col.) A. E. Kidd; Capt. (acting Maj.) J. C. Marklove; Capt. and Bt. Maj. W. J. F. Mayne; Capt. (temp. Maj.) R. P. Nash; Capt. (temp. Lt.-Col.) J. Patrick; Capt. (acting Maj.) H. A. Playfair-Robertson; Capt. J. T. Simson; Capt. (acting Maj.) R. M. Vick; Maj. (acting Lt.-Col.) J. Ward, D.S.O.; Capt. J. Waterston; Capt. W. C. D. Wilson.

A.M.S.—Temp. Col. L. S. Dudgeon, C.M.G.; Maj.-Gen. M. P. C. Holt, K.C.M.G., C.B., D.S.O.

I.M.S.—Capt. P. J. Veale; Temp. Lt. A. F. B. Saldanha; Maj. W. J. Powell; Temp. Lt. Mohamed Nawaz.

Mesopotamia.

R.A.M.C.—Temp. Capt. H. G. Baynes; Lt.-Col. (temp. Col.) J. H. R. Bond, D.S.O.; Temp. Capt. W. Browne; Temp. Capt. T. P. Buist; Capt. (acting Lt.-Col.) E. T. Burke, D.S.O. (S.R.); Lt.-Col. (temp. Col.) E. W. W. Cochrane, D.S.O.; Temp. Capt. W. MacC. Conley; Maj. (acting Lt.-Col.) W. Davis; Lt.-Col. G. G. Delap, C.M.G., D.S.O.; Capt. and Bt. Maj. L. Dunbar; Temp. Capt. W. A. L. Dunlop; Capt. (acting Lt.-Col.) W. J. Dunn; Lt.-Col. J. G. Foster; Lt. (temp. Capt.) O. D. Jarvis; Temp. Capt. I. W. Jones; Capt. (acting Maj.) D. H. C. MacArthur; Temp. Capt. A. MacMillan; Capt. and Bt. Maj. W. MacNaughtan; Capt. (temp. Maj.) O. H. Mayor (S.R.); Temp. Capt. W. M. Menzies; Capt. and Bt. Maj. T. J. Mitchell, D.S.O.; Lt.-Col. (temp. Col.) H. M. Morton, D.S.O.; Temp. Capt. S. Murray; Maj. H. W. Russell; Maj. (acting Lt.-Col.) A. W. Sampey; Temp. Capt. A. F. Sanderson; Temp. Maj. (acting Lt.-Col.) E. W. Skinner; Lt.-Col. and Bt. Col. J. M. Sloan, C.M.G., D.S.O.; Capt. J. S. Sloper; Capt. (acting Maj.) E. P. A. Smith, M.C.; Lt.-Col. W. M. B. Sparkes, D.S.O.; Temp. Capt. C. R. Taylor; Capt. R. R. Thompson, M.C.; Capt. (acting Maj.) H. C. Todd; Temp. Capt. A. Topping; Maj. N. D. Walker; Capt. J. M. Weddell; Lt.-Col. J. F. Whelan, D.S.O.; Temp. Capt. J. S. Young.

R.A.M.C. (S.R.).—Capt. J. W. W. Baillie; Capt. J. M. H. Campbell; Capt. (acting Maj.) J. P. Charnock; Capt. (acting Maj.) W. Dunlop, O.B.E.; Capt. H. L. Garson, M.C.; Capt. R. W. Macdonald; Capt. K. B. MacGlashan; Capt. J. M. Morrison; Capt. J. B. Steven; Capt. (acting Maj.) P. Thornton, M.C.

R.A.M.C. (T.F.).—Capt. A. E. Bonham; Capt. T. A. Fisher; Lt.-Col. F. E. Fremantle; Maj. (acting Lt.-Col.) R. Griffith; Capt. F. T. H. Wood.

A.M.S.—Col. (temp. Maj.-Gen.) A. P. Blenkinsop, C.B., C.M.G.; Col. P. Evans, C.M.G.; Col. J. D. Ferguson, C.M.G., D.S.O.; Temp. Col. T. P. Legg, C.M.G.; Col. A. H. Morris; Col. W. T. Mould; Col. W. H. Starr, C.B., C.M.G.; Temp. Col. W. H. Willcox, C.B., C.M.G.

I.M.S.—Capt. H. G. Alexander; Maj. (acting Lt.-Col.) W. M. Anderson; Maj. A. J. V. Betts; Capt. H. M. Collins; Maj. (acting Lt.-Col.) F. P. Connor, D.S.O.; Lt.-Col. H. M. Cruddas, C.M.G.; Capt. H. J. M. Cursetjee, D.S.O.; Temp. Capt. M. Das; Lt.-Col. C. D. Dawes; Maj. W. J. Fraser; Maj. (acting Lt.-Col.) A. B. Fry, D.S.O.; Maj. (acting Lt.-Col.) L. E. Gilbert; Maj. (temp. Lt.-Col.) W. Gillitt, C.I.E.; Maj. and Bt. Lt.-Col. C. M. Goodbody, C.I.E., D.S.O.; Maj. and Bt. Lt.-Col. J. D. Graham; Lt.-Col. (temp. Col.) J. A. Hamilton, C.M.G.; Maj. and Bt. Lt.-Col. W. H. Hamilton, D.S.O.; Capt. J. C. John; Maj. (acting Lt.-Col.) W. D. A. Keys; Lt.-Col. R. H. Maddox; Maj. P. S. Mills; Capt. J. B. de W. Molony; Capt. A. C. Munro; Maj. E. B. Munro; Temp. Capt. C. E. R. Norman; Capt. H. E. Shortt; Temp. Capt. A. D. Shroff; Lt.-Col. G. E. Stewart; Capt. (acting Maj.) M. L. Treston; Capt. W. L. Watson; Maj. V. N. Whitamore; Capt. (acting Maj.) W. E. R. Williams.

Dr. M. Young, C.I.E.

East Africa.

R.A.M.C.—Temp. Capt. W. D. Allan; Temp. Capt. J. Brierley; Temp. Capt. G. A. Cowley; Temp. Capt. R. P. Garrow; Temp. Capt. A. G. Lumsden; Temp. Maj. T. C. McKenzie; Temp. Capt. N. S. Neill; Temp. Capt. G. H. Shaw; Temp. Capt. J. A. Struthers; Temp. Capt. L. H. D. Thornton; Capt. J. F. C. Braine (S.R.); Capt. D. C. Buchanan (S.R.); Capt. F. J. C. Johnstone (S.R.); Capt. R. Lloyd-Jones (S.R.); Capt. G. L. Malcolm-Smith (S.R.); Capt. R. R. Scott, M.C. (S.R.)

I.M.S.—Capt. I. D. Grant; Capt. J. J. Liston.

South African Medical Corps.—Lt. G. Bidwell; Capt. L. W. Blazey; Capt. H. J. Brady; Capt. (acting Maj.) S. Copley; Capt. J. Duncan; Capt. E. W. Ingle; Capt. (acting Maj.) W. H. R. Sutton; Temp. Capt. F. Basecq; Temp. Capt. A. H. de W. Budler; Temp. Capt. H. G. Choulers; Temp. Capt. L. G. Irvine; Temp. Capt. H. Jones; Temp. Capt. J. S. McDonald; Temp. Capt. R. D. Osler; Temp. Capt. A. Smith; Temp. Capt. H. M. von Mengershausen.

Miscellaneous Medical Services.—Temp. Maj. D. J. Courtney, West Afr. Med. Serv.; Capt. E. J. Quirk, West Afr. Med. Serv.; Capt. J. M. Mackinnon, East Afr. Med. Serv.; Maj. G. C. Strathairn, Uganda Med. Serv.; Maj. C. A. Wiggins, Uganda Med. Serv.

Sudan.

R.A.M.C.—Lt.-Col. F. F. Carroll, D.S.O.; Maj. C. Cassidy; Capt. S. McK. Saunders; Maj. R. G. Archibald, D.S.O.; Maj. D. S. B. Thomson.

Dr. A. J. Chalmers, Director of the Wellcome Laboratories, Khartoum.

Russia.

Archangel.—R.A.M.C.—Capt. (acting Lt.-Col.) D. C. I. Fitzwilliams (T.F.); Capt. N. H. Harrison (S.R.); Capt. A. Irvine-Fortescue; Capt. (acting Lt.-Col.) T. H. Richmond (T.F.).

Murmansk.—R.A.M.C.—Capt. (temp. Maj.) C. G. G. Keane; Temp. Capt. A. H. Macklin; Temp. Capt. (acting Maj.) G. Muir; Capt. (temp. Lt.-Col.) J. J. D. Roche.

THE SERVICES.

ROYAL NAVAL MEDICAL SERVICE.

Surg. Vice-Admiral Sir W. H. Norman, K.C.B., placed on the retired list at own request.

Surg. Capt. Sir R. Hill, K.C.M.G., C.B., C.V.O., to be Surgeon Rear-Admiral.

Surg. Cmdr. J. D. Hughes placed on retired list with rank of Surgeon Captain.

Surg. Cmdr. R. H. J. Browne placed on retired list with rank of Surgeon Captain.

ARMY MEDICAL SERVICE.

Temp. Col. F. Fraser relinquishes his commission and retains the rank of Colonel.

Temp. Col. C. S. Ryan, C.B., C.M.G., relinquishes his commission.

Temp. Col. D. W. Carmalt-Jones (Capt., R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. J. A. Hartigan, C.M.G., D.S.O., to be acting Colonel whilst specially employed.

Temp. Lieut.-Col. A. M. H. Gray (Major, R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

Major and Brevet Lieut.-Col. J. A. Anderson relinquishes the temporary rank of Lieutenant-Colonel on re-posting.

The undermentioned relinquish the acting rank of Lieutenant-Colonel on re-posting: Major and Brevet Lieut.-Col. C. W. Holden; Majors C. G. Thomson, T. E. Harty, C. T. Edmunds, W. J. Weston; Capt. and Brevet Major J. A. Manifold.

Major A. F. Heaton, on ceasing to be employed, is granted the rank of Lieutenant-Colonel.

Capt. J. Vallance relinquishes the acting rank of Major on re-posting.

Capt. R. G. S. Cane to be acting Major whilst specially employed.

Temp. Capt. F. C. Tibbs to be acting Major.

Temp. Capt. J. T. Grant to be acting Major whilst specially employed.

Temporary Captains relinquish the acting rank of Major: A. Mathieson, R. H. Stevens, E. B. Sunderland, D. Cowin, L. D. Woods, W. de M. Peyton, W. E. Hallinan.

Temp. Lieuts. G. P. G. Beckett, J. M. H. Caldwell, and A. B. Rosher to be temporary Captains.

Officers relinquishing their commissions:—Temp. Lieut.-Col. and Bt. Col. W. L'E. Eames (Lieutenant-Colonel, Austr. A.M.C.). Temporary Majors retaining the rank of Major: T. W. Eden, G. E. Waugh, R. H. T. Nash, A. R. Ferguson, A. Phillips, R. T. Meadows. Temp. Capt. E. A. Gates (granted rank of Lieutenant-Colonel). Temporary Captains granted the rank of Major: J. S. Hall, D. I. Anderson, D. Murphy, F. T. Hill, R. A. P. Hill, J. McDonnell, J. F. M. Sloan, B. Cox, H. Young, J. P. Duncan, F. N. Brown, A. J. Clayton, L. H. Guest, W. H. Hardy, L. D. Woods, A. E. Rayner. Temporary Captains retaining the rank of Captain: H. Smith, E. H. Fennessey, J. A. Fretton, G. Hargreaves, D. S. Graham, A. E. Clark, B. H. Palmer, D. Gillies, F. Anderson, H. L. Taylor, H. A. Pallant, R. Anderson, C. J. McCarthy, C. W. Budden, J. McGibbon, R. W. Gemmell, G. F. C. Healy, C. A. R. McCay, G. Jefferson, E. A. Bernard, N. Grellier, G. B. McCaul, J. Good, C. C. Lord, W. W. Ingram, H. M. Gillespie, G. M. Campbell, C. E. O'Keefe, J. B. Mackenzie, C. B. Pearson, C. J. Stanley, T. J. H. Hoskin, J. S. Webster, V. Townrow, G. P. G. Beckett, F. S. Machin, A. Wylie, E. P. Carey, W. G. R. Macauley, J. G. Leslie, J. Campbell, A. B. McMaster, J. Colgan, A. H. James, W. B. Haywood, J. C. N. Harris, F. O'Neill, G. H. Adam, J. M. McLachlan, A. Walbrugh, R. McC. Service, T. H. Just, W. R. Honeyburne, H. A. Gillespie, H. G. Wilson, E. J. B. Moynihan, E. N. Snowden, G. H. Thompson, T. Mac Kinlay, A. G. C. Plumley, A. M. Jones, W. J. McIvor, R. N. West, W. W. Thomson, E. Banks, L. R. Hill, J. G. Greenfield, J. F. Findlay, J. H. Moir, J. K. M. Dickie, R. R. Duncan, G. Miller, H. S. Dixon, S. C. Wilkinson, S. C. Dyke, J. Fraser, D. E. Derry, H. J. Couchman, F. Challans, G. C. Belcher, D. Fleck, J. J. K. Pentony, A. W. G. Clark, C. Price-Jones, H. D. Duke, R. M. Coalbank, C. M. Brophy, J. Chisholm, G. H. Culverwell, J. C. Fox, K. L. Bates, A. Bremner, H. E. Battle, C. G. H. Moore, H. T. P. Young, W. E. David, G. M. Brunton, G. A. Johnstone, W. Rotheram, A. H. Firth, D. Broderick, J. A. Wood, A. B. Rosher, E. A. C. Swainson, A. Evans, A. B. Leakey, W. Cook, A. H. Birks, L. R. Lempriere, H. C. Colyer, A. S. Findlay, S. McNaughton, H. M. Gilbertson, J. L. Williams, G. Arthur, H. E. M. Wall, A. H. Little, M. T. Cassidy, H. Carson, J. Mathewson, P. T. T. MacDonald, E. D. Adrian, A. Dennison, G. H. Kearney, H. E. Williams, F. Crooks, F. H. Bromhead, R. Wade, J. B. Aickin, S. W. Davies, H. R. Dew, S. R. Atkinson, J. F. Douse, R. Peart, J. F. Peart, J. H. Dible, C. Crerar, E. H. Wheeler, W. Edgecombe, S. Wigglesworth, A. Ashmore, A. G. Maitland-Jones, W. J. Dunlop, G. A. Crowley, U. Marks, H. V. Forster, D. Duncan, P. G. Leeman, H. M. Johnston, C. B. M. Aldridge, F. Atthill, J. Beatty, J. C. Lavertine, S. D. Bridge, W. W. Walker, J. G. Brown, W. H. Brodie, J. Mowat, H. H. Fairfax, E. F. Edmunds, L. Walton, W. Baxter, W. G. Lidderdale, G. H. Mead. Temporary Honorary Captains retaining the honorary rank of Captain: H. Nockolds, C. G. L. Wolf. Temporary Lieutenants retaining the rank of Lieutenant: J. Eadie, O. Eccles, P. C. MacRobert, O. Marriott, R. C. McLaughlin, C. A. Palmer, H. W. Freer, N. S. Twist, A. Bisset.

Canadian Army Medical Corps.

Temp. Major R. M. Filson to be temporary Lieutenant-Colonel.

Temp. Major J. L. Cock to be acting Lieutenant-Colonel.

Temp. Major G. W. Treleaven to be acting Lieutenant-Colonel and to command No. 5 Canadian Field Ambulance.

Temporary Captains to be acting Majors: R. B. Mitchell, J. Pullar, N. W. Strong, F. A. Brockenshire, C. K. Dowson.

SPECIAL RESERVE OF OFFICERS.

Capt. A. J. Gibson relinquishes the acting rank of Lieutenant-Colonel.

Captains relinquishing the acting rank of Major: W. Dunlop, W. R. Blore, R. Green, E. A. Wilson.

Capt. A. J. Beveridge to be acting Major.

Capt. A. McA. Blackwood relinquishes his commission.

Capt. R. L. Portway relinquishes his commission and retains the rank of Captain.

TERRITORIAL FORCE.

Lieut.-Col. (acting Col.) H. A. Wraith relinquishes his acting rank on vacating the appointment of Assistant Director of Medical Services.

Majors (acting Lieut.-Cols.) M. B. Ray, A. J. Riddett, W. Duncan, G. F. Whyte relinquish their acting rank on ceasing to be specially employed.

Captains (acting Majors) to be acting Lieutenant-Colonels whilst specially employed: A. C. Pearson, J. W. Craven, R. A. Stark.

Capt. (acting Lieut.-Col.) W. Duncan to be Major, and to retain his acting rank whilst specially employed.

Capt. (acting Lieut.-Col.) M. S. Doubble relinquishes his acting rank on ceasing to be specially employed.

Capt. (acting Major) S. R. R. Matthews relinquishes his acting rank on vacating the appointment of Deputy Assistant Director of Medical Services.

Capt. M. Coplans to be a Deputy Assistant Director of Medical Services, and to be acting Major whilst so employed.

Capts. (acting Majors) E. J. Boome, W. P. Fergusson, A. A. Hingston, J. A. Bell, A. P. Thomson, W. V. Wood, R. V. C. Ash, H. Shield, H. A. Lucas relinquish their acting rank on ceasing to be specially employed.

Capt. (acting Major) F. J. B. Robson relinquishes his commission.

Capts. S. Rutherford, O. Gleeson, J. K. Syms relinquish their commissions and retain the rank of Captain.

Lieut. J. H. Churchill to be Captain.

1st Southern General Hospital: Capt. (acting Major) F. D. Marsh relinquishes his acting rank on ceasing to be specially employed and remains seconded.

2nd Southern General Hospital: Capt. A. R. Short is restored to the establishment.

2nd London General Hospital: Capt. H. F. Lancaster is seconded for service with the Hampstead Military Hospital.

3rd London General Hospital: Lieut.-Col. W. Pasteur, C.M.G., is restored to the establishment on ceasing to hold a temporary commission in the Army Medical Service.

4th London General Hospital: Capt. (acting Lieut.-Col.) A. J. Jex-Blake relinquishes the acting rank of Lieutenant-Colonel and reverts to the acting rank of Major, and remains seconded.

3rd London Field Ambulance: Capt. M. Coplans to be acting Major whilst specially employed.

1st Scottish General Hospital: Capt. H. B. Smith is restored to the establishment.

2nd Scottish General Hospital: Major (acting Lieut.-Col.) J. D. Comrie relinquishes his acting rank on ceasing to be specially employed and remains seconded.

2nd London Sanitary Company: Lieut. G. M. Till to be Captain.

ROYAL AIR FORCE.

Medical Branch.—Major A. W. Iredell to be Lieut.-Colonel. G. F. Marshall and E. A. Lumley granted temporary commissions as Captains. J. Fanning and C. T. O. Neill granted temporary commissions as Lieutenants. Major R. R. Fasson, R.N., Capts. C. Webb and J. D. Bridger are transferred to the Unemployed List.

Dental Branch.—I. M. Thomson is granted a temporary commission as Captain.

Parliamentary Intelligence.

HOUSE OF COMMONS.

WEDNESDAY, JUNE 4TH.

Income Limit Under the Insurance Act.

Sir KINGSLEY WOOD asked the Secretary to the Local Government Board, as representing the National Health Insurance Commissioners, whether he could now state if it was proposed to introduce legislation in connexion with the amount of the income limit under the National Insurance Act.—Mr. PRATT (Lord of the Treasury) replied: It is not proposed to make any alteration of principle as regards the range of persons who were intended by the Act of 1911 to come within National Health Insurance, nor to bring in any class of the community not hitherto included. No alteration is contemplated in the £160 limit for voluntary contributors. But I hope to introduce a short Bill for the consideration of Parliament after the recess for the purpose of preventing the deprivation of benefits that will otherwise take place after June 30th in the case of that large number of insured persons whose wages have been raised since the war, so as to be at a higher rate of remuneration than £160, but who have not thereby been raised above the economic status of the persons included in the Act of 1911. I am publishing a statement which will explain the details of the proposal and the various matters that are incidental to it.

Services of Medical Men in the War.

Brigadier-General CROFT asked the Secretary of State for War whether his attention had been called to the services rendered to the wounded by certain medical officers engaged in medical and surgical research during the war; and whether, in consideration of the final list of honours, he would bear in mind the claims of those who, although not engaged on active service, had contributed so largely to the comfort and recovery of the wounded by scientific research.—Mr. CHURCHILL replied: The answer to the first part of the question is in the affirmative. As regards the remainder of the question, my honourable and gallant friend will find that those he refers to have not been overlooked in the *Peace Honours Gazette*, in which a very large number of medical officers are included. Rewards for home service will appear in the press on June 5th and other higher honours on June 10th.

Venereal Disease Among the Troops.

Sir T. BRAMSDON asked the Secretary for War whether venereal disease was spreading rapidly amongst the British troops in Germany now that they had left the trenches and gone to billets in towns and villages there; whether troops returning to England showed a greater incidence of venereal disease than troops at home; whether diseased German prostitutes abounded in the occupied areas and conveyed infection to many of our troops there; and what effectual measures were being taken to protect British troops from such disease.—Mr. CHURCHILL replied: A report has been called for on this matter, and I will communicate with my honourable friend later.

Medical Supplies of Brandy and Whisky.

Sir FORTESCUE FLANNERY asked the Food Controller whether his attention had been called to the difficulty, still continuing, of obtaining certified medical supplies of brandy or whisky for invalids; whether he was aware that on a recent date no licensed house within a radius of seven miles all round the town of Maldon, in Essex, had any spirits whatever, and that numerous medical certificates were unfulfilled and danger and suffering to patients arose in consequence; whether he could state the reasons for the

continuance of such restrictions; and whether they would be immediately removed.—Mr. ROBERTS replied: My attention has not previously been called to any shortage of spirits in the Maldon district. According to the information at my disposal the quantities of spirits now permitted to be released from bond should be sufficient for any reasonable requirements of the public. I would remind the honourable Member that, as has already been stated, the question of modifying the present restrictions is one for the War Cabinet and not the Ministry of Food.

THURSDAY, JUNE 5TH.

Vaccination Prosecutions in Wexford.

Mr. WATERSON asked the Chief Secretary to the Lord Lieutenant of Ireland whether his attention had been called to the heavy costs demanded in vaccination prosecutions at Wexford; whether he had ascertained how those costs were made up; whether Section 10 of the Irish Vaccination Act of 1879 required the costs in vaccination prosecutions to be paid out of the poor-rates; and whether he would order the return of the money to those who had paid these illegal costs and compensation to those who had been obliged to suffer imprisonment in default of payment.—Mr. HENRY (Solicitor-General for Ireland) replied: It appears that the costs in the recent vaccination prosecutions in Wexford vary from 2*s.* 6*d.* to 7*s.*, as well as the fine in each established case of default. The Local Government Board are advised that the persons in default are liable for costs in addition to the penalty prescribed by Section 7 of the Vaccination (Amendment) (Ireland) Act, 1879. The costs are measured by the Petty Sessions Court, and the Board have no power to review the amount or to order a refund of the costs imposed by a court of law.

Treatment of the Blind in Ireland.

Mr. DONALD asked the Chief Secretary to the Lord Lieutenant of Ireland whether he would state if the Advisory Committee for the Blind in Ireland had applied to the Government for financial support for these most deserving people; and, if so, with what result.—Mr. HENRY replied: The Committee have applied for financial assistance from the Government, but the Treasury have refused a grant until legislation has been introduced.

Medical News.

UNIVERSITY OF LONDON.—At examinations held recently the following candidates passed in one of the two groups of subjects:—

THIRD (M.B. B.S.) EXAMINATION FOR MEDICAL DEGREES.

Group I.—Ursula Poussett Blackwell and Nora Annie Crow, London Sch. of Med. for Women; Evan Sherrah Davies, Westminster Hosp.; Florence Marjory Edwards and Edith Caroline Hudgell, London Sch. of Med. for Women; Ernest Francis Kerby, Guy's Hosp.; Ronald Guy Lyster, St. Bart.'s Hosp.; Framroz Nanabhoy Moos, Univ. Coll. Hosp. and Grant Med. Coll.; Edith Mary Ponsonby Morris, St. Mary's Hosp.; Dorothy Priestley Priestley, Leeds Univ.; Trevor Cecil Russell, St. Mary's Hosp.; Herbert William Southgate, B.Sc., Guy's Hosp.; Charles Hamblen Thomas, St. Bart.'s Hosp.; William Yeoman, Univ. Coll. Hosp.; and William Ronald White-Cooper, St. Bart.'s Hosp.

Group II.—Iskander Mikhail Abd-El-Said, Univ. Coll. Hosp.; Wilfred Mark Anthony, St. Thomas's Hosp.; John Anthony Birrell, Cardiff and Bristol Univs. and St. George's Hosp.; Charles Hugh Colclough Byrne, St. Thomas's Hosp.; John Andrew Cairns Forsyth, Leeds Univ.; Reginald Stafford Foss, St. Thomas's Hosp.; Muriel Mercer Kenworthy, London School of Med. for Women and Liverpool Univ.; Gdal Leizer Levin, University Coll. Hosp.; Ernest Kenneth Macdonald and Charles Dundas Maitland, St. Thomas's Hosp.; Manek Jamshedji Panthaky, King's Coll. Hosp.; Mary Millicent Prior and Joan Margaret Ross, St. Mary's Hosp.; William Richard Rowlands, Liverpool Univ.; John Francis Ryan, St. Thomas's Hosp.; Evelyn Dennis Scott, Guy's Hosp.; and John Woollaston Wayte, St. Thomas's Hosp.

GREAT NORTHERN CENTRAL HOSPITAL.—The annual view day will be held on Thursday next, June 19th, at 3 P.M., when the chairman (the Marquess of Northampton) will receive visitors in the board room.

LECTURES AT THE LONDON HOSPITAL MEDICAL COLLEGE.—Courses of special lectures will be delivered at the London Hospital Medical College, Mile End, E., during June and July, to which members of the medical profession will be admitted on presentation of their cards. On June 16th and 23rd Dr. O. Leyton will deliver two lectures on the Treatment of Diabetes in Children and Adolescents at 4 P.M. On June 12th, 16th, 19th, and 23rd Dr. C. H. Miller will lecture, taking for his subjects Gunshot Wounds of the Chest, Influenza, and Dysentery from the point of view of the military physician. The lectures commence at 12.15 P.M. At 4.15 P.M. on Mondays, Wednesdays, and Fridays from June 11th to July 2nd inclusive Dr. P. N. Panton will deliver a course of ten lectures, with practical demonstrations, on Routine Laboratory Methods, including the Diagnosis of Venereal Disease.

URBAN VITAL STATISTICS.

(Week ended June 7th, 1919.)

English and Welsh Towns.—In the 96 English and Welsh towns, with an aggregate civil population estimated at 16,500,000 persons, the annual rate of mortality, which had declined from 13·7 to 10·7 in the five preceding weeks, further fell to 10·6 per 1000. In London, with a population slightly exceeding 4,000,000 persons, the death-rate was 10·4, or 0·1 per 1000 above that recorded in the previous week, while among the remaining towns the rates ranged from 3·9 in Oxford, 4·2 in Edmonton, and 5·1 in Swindon, to 16·2 in Exeter, 16·3 in Tynemouth, and 24·0 in Dewsbury. The principal epidemic diseases caused 142 deaths, which corresponded to an annual rate of 0·4 per 1000, and included 39 from measles, 37 from infantile diarrhœa, 35 from diphtheria, 16 from whooping-cough, 13 from scarlet fever, and 2 from enteric fever. Measles caused a death-rate of 1·7 in Middlesbrough, 2·0 in Dudley, 2·3 in West Bromwich, and 4·0 in Rotherham; and whooping-cough of 1·3 in Hull. There were 3 cases of small-pox, 1093 of scarlet fever, and 1087 of diphtheria under treatment in the Metropolitan Asylums Hospitals and the London Fever Hospital, against 3, 1078, and 1100 respectively at the end of the previous week. The causes of 30 deaths in the 96 towns were uncertified, of which 6 were registered in Birmingham, 4 in Preston, and 3 in St. Helens.

Scotch Towns.—In the 16 largest Scotch towns, with an aggregate population estimated at nearly 2,500,000 persons, the annual rate of mortality, which had declined from 13·7 to 12·8 in the three preceding weeks, further fell to 12·3 per 1000. The 275 deaths in Glasgow corresponded to an annual rate of 12·8 per 1000, and included 17 from whooping-cough, 6 from measles, 2 from infantile diarrhœa, and 1 from diphtheria. The 85 deaths in Edinburgh were equal to a rate of 13·2 per 1000, and included 5 from whooping-cough and 2 from measles.

Irish Towns.—The 120 deaths in Dublin corresponded to an annual rate of 15·5, or 0·3 per 1000 below that recorded in the previous week, and included 3 from infantile diarrhœa and 1 from enteric fever. The 95 deaths in Belfast were equal to a rate of 12·4 per 1000, and included a fatal case each of scarlet fever, whooping-cough, and diphtheria.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

BRYAN, CHARLES W. G., M.C., F.R.C.S., has been appointed Surgeon to Out-patients at the Paddington-green Children's Hospital.

Surgeons under the Factory and Workshop Acts: HENRY, S. A., M.D. Cantab. (Rochdale); MORAN, J. P., M.B., B.Ch. N.U.I. (Carney).

Vacancies.

For further information refer to the advertisement columns.

Aberdeen University.—Lecturer in Pathology. £700.
Bethlem Royal Hospital, Lambeth-road, S.E.—Two Hon. Neurologists.
Bethnal Green, Metropolitan Borough.—M.O.H. £750.
Birkenhead and Wirral Childrens' Hospital, Woodchurch-road.—H.S. £150.
Birmingham City Education Committee.—Schl. Dent. S. £275.
Birmingham General Hospital.—H.S. £125. Also Asst. P. £50
Birmingham University, Faculty of Medicine.—Prof. of Path. £900. Also Demonstrator of Anatomy. £250.
Blackburn County Borough.—Asst. M.O.H. £600.
Bournemouth, Royal Victoria and West Hants Hospital.—Res. H.S. £200.
Bristol University.—Professor of Physiology. £800.
Camberwell Infirmary, Brunswick-sq.—Asst. M.O. 7 gns. weekly.
Carmarthen Mental Hospital.—Second Asst. M.O. £250.
Cumberland County and City of Carlisle.—Asst. M.O. £600.
Dartford, Kent, City of London Mental Hospital.—Second Asst. M.O. £250.
Derby, Derbyshire Royal Infirmary.—H.S. £200.
Devonport, Royal Albert Hospital.—Res. H.S. £200.
Dorset County Council Education Committee.—School Dentists. £350.
Dundee Corporation.—Asst. Tubero. O. £300.
Durham University.—Asst. in Department of Bacteriology. £500.
East Sussex County Council Education Committee.—Jun. Asst. School M.O. £400.
Elizabeth Garrett Anderson Hospital, Euston-road.—Female Path. £35. Also Asst. Path. £100.
Farringdon General Dispensary and Lying-in Charity, 17, Bartlett's-buildings, Holborn Circus, London, E.C.—Hon. Dental S.
Frere Hospital, East London, Cape Province, S. Africa.—Res. M.O. £350.
Glamorgan County Council, Medical Inspection of Children in Schools. Two M.O.'s. £500.
Glasgow, Anderson College of Medicine, Dumbarton-road.—Appointments to Chairs of Anatomy, Chemistry, and Physiology.
Gloucestershire Royal Infirmary and Eye Institution.—H.S. and Asst. H.S. £200 and £75.
Great Northern Central Hospital, Holloway-road, N.—Female Asst. M.O. £1 1s per session.
Hampstead General and North-West London Hospital, Haverstock-hill N.W.—H.S. £100.
Heston and Isleworth Urban District Council.—M.O.H. and Sch. M.O. £750. Asst. M.O.H. and Asst. Sch. M.O. £450.
Hull Royal Infirmary.—H.P. £200.
Kent Education Committee.—School Medical Inspector. £352.
King Edward VII. Sanatorium, Midhurst, Sussex.—Med. Supt. £800 Also Pathologist, £400.

Liverpool, Stanley Hospital.—H.P.
London Hospital, Whitechapel, E.—Two Hon. Dent. S.
London (Royal Free Hospital) School of Medicine for Women.—Lectureship in Forensic Medicine and Toxicology.
Maidstone, Lenham Sanatorium.—Med. Supt. £600.
Manchester Ear Hospital, Grosvenor-square, All Saints.—H.S. £40.
Manchester, Hulme Dispensary.—Hon. S.
Manchester, St. John's Hospital of Manchester and Salford for the Ear.—Anæsth. £50.
Middlesex County Council.—Asst. M.O. in the Public Health and School Medical Department. £500.
Newcastle-upon-Tyne, Royal Victoria Infirmary.—Refractionist. £100.
New Zealand Public Health Department, Auckland.—Pathologist and Bacteriologist. £700.
Norwich, Norfolk and Norwich Hospital.—H.S. £360.
Nottingham General Hospital.—H.S.'s and Cas. H.S. £250.
Notts County Council.—Clin. Tuberc. O. £600.
Oxford, Radcliffe Infirmary and County Hospital.—H.P. £200.
Oxford University, Department of Human Anatomy.—Demonstrator. £400.
Paisley, Royal Alexandra Infirmary.—Med. Supt. £500.
Plymouth, South Devon and East Cornwall Hospital.—H.S. £200.
Queen Charlotte's Lying-in Hospital, Marylebone-road, N.W.—Dist. Res. M.O. £80.
Royal Free Hospital, Gray's Inn-road, W.C.—Cas. Officer. £100. First H.P. £50. Second H.P. and Anæsth. £50. Female Asst. Obstet. Officer. £50. Also Dermatologist.
Ryde, Royal Isle of Wight County Hospital.—Hon. Pathologist.
St. Bartholomew's Hospital and College.—Sen. Demonstrators and Demonstrators of Phys., Anat., and Path.
St. Bartholomew's Hospital.—S. Also Physician-Accoucheur.
St. George's Hospital, S.W.—Part time Asst. £150. Also Asst. Curator. £100.
Sheffield Royal Hospital.—H.S. £125. Also Asst. Cas. O. £120.
Sheffield Royal Infirmary.—H.S. £150. Also H.S. for Ear, Nose, and Throat. £150.
Southampton County Borough.—Female Asst. M.O. £400.
Southend-on-Sea County Borough.—Deputy M.O.H. and Asst. S.M.O. £450. Also Female Asst. M.O.H. and Asst. S.M.O. £400.
Stoke-on-Trent, North Staffordshire Infirmary, Hartshill.—Female H.S. £200.
Sudan Medical Department.—Med. Inspector. £600.
West Riding County Council.—School Med. Inspector. £400.
Wolverhampton and Staffordshire General Hospital.—Two H.S.'s. £200.
Wrexham Infirmary.—H.S.
York County Hospital.—Pathologist. £500.
York, North Riding Asylum.—Jun. Asst. M.O. £300.

THE Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Churchill, Turriff, Sheerness, Chapel-en-le-Frith, Manorcunningham, and at Birkenhead.

Births, Marriages, and Deaths.

BIRTHS.

MACTIER.—On June 7th, at St. Mary's-place, St. Andrews, the wife of W. B. MacTier, M.B., of a daughter.

SHEEDY.—On June 5th, at Arundel-mansions, Kelvedon-road, S.W., the wife of Captain T. Sheedy, O.B.E., R.A.M.C., of a daughter.

MARRIAGES.

CROWLEY—YATES.—On June 2nd, at the Parish Church, Prestbury, Capt. T. W. Crowley, M.D., R.A.M.C., to Marjorie Hilda Gladys, youngest daughter of H. C. Yates, Esq., The Lower Beech, Tytherington, Macclesfield.

GAUNTLETT—GERRARD.—At the Barclay Church, Edinburgh, on the 4th inst., by the Rev. R. Sangster Anderson, D.D., assisted by the Rev. J. A. Hughes, M.A., The Rectory, North Berwick, Eric Gerald Gauntlett, D.S.O., C.B.E., M.B., F.R.C.S., of King's College Hospital, London, late Lieutenant-Colonel, R.A.M.C. (T.F.), Consulting Surgeon to the Salonica Forces, younger son of Mr. and Mrs. T. Lee Gauntlett, 37, Howards-lane, Putney, London, S.W., to Hilda Mary Gerrard, R.R.C., late V.A.D., Salonica, eldest daughter of Mr. and Mrs. James Gerrard, 24, Hermitage-gardens, Edinburgh. At home, Langham Hotel, Portland Place, London, W., on Thursday, June 26th, 3.30 to 5.30 P.M.

HINE—LILLYWHITE.—On June 4th, at St. Gabriel's, Warwick-square, T. G. Macaulay Hine, M.D., Major, R.A.M.C., to Margaret Ellen, only daughter of Mr. and Mrs. Herbert Lillywhite, of Broadfield, Guildford.

HOWELL EVANS—COOPER WILLIS.—On June 5th, at the Temple Church, J. Howell Evans, M.A., M.D., M.Ch. Oxon., F.R.C.S., to Gwynaeth, youngest daughter of the late Edward Cooper Willis, K.C., and of Mrs. Cooper Willis, Shooter's Hill-road, Blackheath.

LAMBERT—WARD.—On June 4th, at St. Andrew's Church, Nottingham, Frederick Samuel Lambert, Lieutenant Colonel, R.A.M.C. (T.), to Henrietta Ward, A.R.R.C.

NEWTON—WICKSTEAD.—On June 5th, at Adel Church, near Leeds, Alan Newton, A.A.M.C., to Mary Cicely, eldest daughter of J. Hartley Wickstead, M.Inst.C.E., Weetwood Croft, Leeds.

DEATHS.

COLBECK.—On June 2nd, at De Cham-avenue, St. Leonards, Thomas William Colbeck, M.R.C.S., L.R.C.P., late of Dover, aged 83.

EARLE.—On June 5th, at his residence, East Hayes House, Bath, Walter George Earle, M.R.C.S., L.R.C.P., aged 64. Funeral took place on Saturday, the 7th inst., at Locksbrook Cemetery, Bath, at 2.30 P.M.

SHEPPARD.—On June 6th, at Charing Cross Hospital, London, after operation, Walter Sidney Sheppard, M.B., B.S. (retired Colonial Medical Service), Captain, R.A.M.C., aged 48.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Medical Diary for the ensuing Week.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

Tuesday, June 17th.

GENERAL MEETING OF FELLOWS: at 5 P.M.
Ballot for Election to the Fellowship. (Names already circulated.

Thursday, June 19th.

OCCASIONAL LECTURE: at 8.30 P.M.
Dr. Louis Sambon: The Sanitation of Tropical Lands: Suggestions based on West Indian Experience. (By arrangement with the West India Committee.)

MEETINGS OF SECTIONS.

Thursday, June 19th.

DERMATOLOGY (Hon. Secretary—S. E. Dore): at 5 P.M.
Cases will be shown.

Friday, June 20th.

DISEASE IN CHILDREN (Hon. Secretaries—G. E. C. Pritchard, H. C. Cameron, C. P. Lapage): at 4.30 P.M.
Cases:
Dr. Hazel Chodak: Case of Chorea with Gangrene of Fingers.
Other cases will be shown.
Dr. Eric Pritchard: Specimen and Notes on a Case of Abscess of the Liver.

The Royal Society of Medicine keeps open house for medical officers of all the Allied Forces, and invites them to make free use of its library and rooms. The Emergency Post Graduate Scheme, under the charge of the "Fellowship of Medicine," is also open to all medical officers. Particulars of this will be supplied by the Secretary, Fellowship of Medicine, 1, Wimpole-street, London, W. 1.

LONDON DERMATOLOGICAL SOCIETY, St. John's Hospital, 49, Leicester-square, W.C.
TUESDAY, June 17th.—4.15 P.M., Annual General Meeting. Election of Officers and Council. 4.30 P.M., Paper:—Dr. S. Sunderland: The Baths of Old London. Clinical Cases will be shown by Dr. H. C. Samuel, Dr. D. Vinrace, Dr. E. J. D. Mitchell, Dr. S. Kapoor, Dr. W. Griffith, Dr. J. L. Bunch, and Dr. W. K. Sibley.

ROYAL STATISTICAL SOCIETY, 9, Adelphi-terrace, Strand, W.C. 2.
TUESDAY, June 17th.—5.15 P.M., Paper:—Mrs. Walter J. Barton: The Course of Women's Wages. Annual General Meeting.

WEST LONDON MEDICO-CHIRURGICAL SOCIETY, West London Hospital, Hammersmith-road, W.
FRIDAY, June 20th.—8.30 P.M., Cavendish Lecture:—Sir George Makins: The Rôle of the Consulting Surgeon in War.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, Brompton, S.W.
WEDNESDAY, June 18th.—4.30 P.M., Dr. Melville: Demonstration in the X Ray Department.

Communications, Letters, &c., to the Editor have been received from—

A.—Prof. M. Ascoli, Catania; Mr. E. S. Archibald, Ottawa.
B.—Surg.-Gen. Sir David Bruce, K.C.B., A.M.S.; Dr. I. Bram, Philadelphia; Board of Agriculture and Fisheries, Lond.; Major P. Bahr, R.A.M.C.; Mr. W. E. Bullock, Lond.; Surg.-Comm. W. Bastian, R.N.; Mr. A. G. Bedane; British Science Guild, Lond.; Messrs. A. E. Braid and Co., Lond.; Mr. S. C. Biswas, Calcutta.
C.—Dr. E. L. Collis, Lond.; Dr. S. D. Clippingdale, Lond.; Dr. F. G. Crookshank, Lond.; Chicago School of Sanitary Instruction; Children's Country Holidays Fund, Lond.; Chadwick Trust, Lond., Sec. of; Sir F. H. Champneys, Bt., Nutley.
D.—Mr. H. Dickinson, Lond.; Dr. J. P. Davies, Hengoed.
E.—Col. T. R. Elliott, A.M.S.
F.—Mr. R. H. Fasick, Boston; Factories, Chief Inspector of, Lond.; Fiat Press Bureau, Turin; Major E. R. Fothergill, R.A.M.C; Capt. J. H. B. Fry, R.A.M.C.(T.)
G.—Dr. J. G. Greenfield, Lond.; Mr. J. H. Grisdale, Ottawa; Great Northern Central Hospital, Lond., Chairman of; Prof. E. Glynn, Liverpool; Guildford, Medical Officer of Health of; Mr. F. C. Goodall, Lond.
H.—Sir T. Horder, Lond.; Mr. F. L. Hoffmann, Newark; Dr. M. H. Hanna; Mr. T. A. Hutchinson, Lond.; Dr. F. S. D. Hogg, Rickmansworth; Dr. F. Hernaman-Johnson, Lond.
J.—Dr. C. Janicki, Chexbres.
K.—Dr. F. Kidd, Cheltenham.
L.—Mr. R. W. Lloyd, Lond.; Local Government Board, Lond.; Dr. G. C. Low, Lond.; London Hospital Medical College, Sec. of; Local Government Board, Lond., Public Information Branch.
M.—Dr. J. Metcalfe, Lond.; Major A. Macdonald, R.A.M.C.; Dr. N. Macleod, Shanghai; Messrs. Musher and Co., Lond.; Medico-Legal Society, Lond.
N.—National Dental Association, Lond., Sec. and Hon. Treas. of.
O.—Sir W. Osler, Bt., Oxford.
P.—Dr. A. E. Price, Cheltenham.
R.—Dr. H. F. Heaton, Doncaster; Hon. N. C. Rothschild, Lond.; Mr. H. J. Rutherfurd, Jesmond.
S.—Col. Sir C. Symonds, C.B., K.B.E.; Sir G. H. Savage, Whitchurch; Prof. G. E. Smith, Manchester; Dr. J. M. Scott, Lond.; H.M. Stationery Office, Lond.; Dr. N. I. Spriggs, Leicester; Dr. J. F. W. Silk, Lond.; Dr. A. G. Shera, Eastbourne; Prof. E. H. Starling, C.M.G., Lond.
T.—Dr. O. F. N. Treadwell, Lond.; Mr. W. W. Turner, Lond.; Dr. A. H. Thompson, Lond.
W.—Mr. H. L. Whale, Lond.; Lieut. G. H. Winch, R.A.M.C.; Dr. W. Watkins-Pitchford, Johannesburg.
Y.—York Local Medical and Panel Committee.

Communications relating to editorial business should be addressed exclusively to the Editor of THE LANCET, 423, Strand, London, W.C. 2.

Notes, Short Comments, and Answers to Correspondents.

SOME PITFALLS OF GENERAL PRACTICE.

BY H. MORELAND MCCREA, M.D., B.CH.R.U.I.

PART II.—MISLEADING SYMPTOMS AND FALSE ALARMS.

WE have so far only discussed pitfalls which can be avoided by examination based on the use of certain instruments. As regards other pitfalls they had better be considered in relation to the different systems.

The Cardio-Vascular System.

Taking first the cardio-vascular system, it will be agreed that errors more commonly arise through diagnosing conditions which are not present than through dangerous conditions being missed. Those of us who worked on the Medical Appeal Board for Army recruits were surprised how constantly heart lesions were diagnosed, the diagnosis being based on the presence of a murmur which on investigation by the Board was found to be extra-cardiac. Perhaps a more serious pitfall is that associated with extrasystoles; these may lead to such a gross irregularity that fibrillation is suspected, and the patient is put to bad on large doses of digitalis. The error can usually be avoided by listening to the heart sounds and at the same time taking the pulse, or, if it be possible, by exercising the patient so as to increase the heart-rate.

The Respiratory and Abdominal Systems.

A mistake somewhat dangerous for the patient is the diagnosis of acute appendicitis when the lesion is right lobar pneumonia. Unless one is on the look-out for pain referred down the twelfth dorsal nerve mistakes will be made; indeed, it ought to be a routine practice before operating for acute appendicitis thoroughly to examine the base of the right lung. In the left base we often see collapse of the lung produced by a dilated heart or by a pericardium filled with fluid, simulating consolidation and, more often than not, diagnosed as such. It is also a common site for fibrosis of the lung, a condition subject to acute inflammatory attacks, which in their turn simulate pneumonia; here one must examine for the retraction of the chest and its accompanying displacements, which will settle the diagnosis.

Several pitfalls centre round the diagnosis of gastric ulcer based on hæmatemesis. It is well to see that the blood did not originally trickle down from a pad of adenoids and that the patient has not got an enlarged spleen or liver. The diagnosis on the part of a patient of profound constipation or diarrhœa should never be accepted without a rectal examination, and, in addition, in the female, of a vaginal examination. Late in life diarrhœa is often the result of impaction of fæces, and careful examination should be made for new growth. In multiparous women there is an additional cause which ought always to be looked for—namely, a torn perineum. In the descent of the child's head not only is the perineum torn but also the levator ani muscles, and the latter are only too often not repaired when the perineum is sewn up. The consequence is that the power of emptying the rectum is lost.

Before diagnosing chronic appendicitis it is well to examine the kidney region. A stone in the kidney with its associated pain referred down the course of the twelfth dorsal nerve may simulate it; or, again, a movable kidney may give rise to gastric symptoms and also show the tenderness and rigidity of muscles over the region of the cæcum. As regards the latter condition, if the kidney be pushed up into its normal habitat all tenderness and rigidity will disappear.

The Nervous System.

Neuritis is a diagnosis which should never be made till one has thoroughly examined to see whether it is merely a symptom attendant on another condition or an entity in itself. Take, for example, persistent neuritis in the fifth nerve. This never ought to be accepted till a thorough examination of the teeth and sinuses has been made; again, in cases of neuritis in the arm, an extra cervical rib must not be forgotten and, lastly, neuritis of the sciatic nerve may be due to some pathological condition in the pelvis. If these conditions which are known to cause neuritis are not excluded it is useless attempting treatment.

As a diagnosis neurasthenia ought to be made with the greatest rarity and yet this word is one of the commonest in medical phraseology. For most neurasthenic conditions there is a physical or pathological basis, and before making a diagnosis of neurasthenia the following conditions should be excluded, for each of them can produce the neurasthenic state: (1) eye-strain; (2) septic infection of the nasal sinuses; (3) septic teeth; (4) chronic constipation dependent on dropping of the pelvic organs as a result of a torn perineum; and lastly, and very important, (5) a chronic infection of the urinary tract.

The Personal Equation.

There is still a pitfall which has not yet been mentioned, and perhaps it is most important and most dangerous of all—namely, that a patient may be suffering from two pathological conditions at one and the same time. There is another very important point which arises out of this also, and that is, a practitioner may get stale on his case. We all know that after long attendance on a case, particularly if for some prominent intractable symptoms, it is easy to miss some entirely new condition which has arisen. I am personally of the opinion that in any long-drawn-out case by far the wisest thing to do is to ask for a further opinion, for the intervention of a fresh mind and fresh brain frequently alters the whole perspective.

MEDICINAL HERB-GROWING.

MEDICINAL herb-growing may appeal to some of the disabled men and others not physically strong, and the exigencies of war have shown the pursuit to be both practical and remunerative. At "The Whins" Medical and Commercial Herb-Growing Farm, Chalfont St. Peter, Bucks, a prospectus of which has reached us, we learn that the cost of a year's training at the farm is about £31, while remuneration from employment may commence at about £3 per week when the pupil is qualified. The capital required to start a herb farm is estimated at £500 and two acres of land, and it is suggested that a profit of £200 a year may be anticipated from the first. Attention is called to the need for finding some means of utilising vacant lands and to the fact that "as the movement spreads—as spreading it is—teachers and organisers will be in demand wherever it reaches."

TYPHUS IN EUROPE.

VIENNA is alive to the danger of a serious typhus epidemic. From time to time Russian prisoners have brought the infection with them, but the strict hygienic measures adopted in the city prevented further spread of the disease. But the danger from surrounding infected countries is daily increasing. Last month the International Red Cross Committee, under the presidency of Dr. Ferrière, sat in the Austrian Red Cross House in Vienna along with representatives of Czecho-Slovakia, German Austria, Jugo-Slavia, Italy, Poland, Roumania, the Ukraine, and Hungary. With active Government support the Austrian Red Cross has now sent two mobile hospitals to the Ukraine, including four mobile disinfecting stations, two bacteriological field laboratories, and a mobile delousing unit. Immune personnel has been chosen as far as possible from the Slav-speaking doctors, nurses, and orderlies. We are glad to note that Vienna is in a position to render such effective help.

THE GOAT AS A MILK SUPPLIER.

THE goat is a useful milk-producing animal for the cottager and smallholder, and the war with a consequent scarcity and high price of cow's milk has made the merits of the animal more prominent. Thanks to the efforts of the British Goat Society considerable progress has been made in goat-keeping during the last 40 years. Thirty years ago little more than three quarts was the record daily yield of a good specimen of goat, while at the present time it is not uncommon to find goats giving a gallon and, in exceptional cases, nearly five quarts a day. Children thrive on the milk, which is eminently suited for culinary purposes. The housing and feeding of the goat is, in addition, very economical. It was so long ago as 1875 that the late Baroness Burdett Coutts set the example of rearing goats on large estates, an example well worthy of imitation.

ENHAM VILLAGE CENTRE.

THE object of the Village Centres Council is to combine vocational training with convalescent treatment in the most favourable natural environment. The first centre was opened without ostentation last week at Enham Place, near Andover, where every prospect is calculated to please and to restore to its pristine vigour the vile body of man. The estate, which will be capable of housing 150 men with the necessary staff, has been purchased for £50,000, a proportion of which has been already subscribed. The British Red Cross Society has given £10,000 for the erection and equipment of the medical block. Some grants have been made by the Government, though it is not easy to see why they should not have guaranteed the whole expense. The cases are selected by Local War Pensions Committees, and the work is undertaken entirely in the interests of the State and as a recognition of the country's obligations. Perhaps when this centre has proved its utility the National Treasury may be induced to give grants for similar centres in other parts of the country.

COLONIAL HEALTH REPORTS.

Mauritius.—According to the report on the Blue-book for 1917, prepared by Mr. L. Kœnig, Assistant Colonial Secretary, the estimated population on Dec. 31st was 384,951. The birth-rate for the year was 36·9 per 1000 of the estimated population and the death-rate 32·5 per 1000. Infant mortality continues very high—about a sixth of the children born die before they are a year old. The public health during the year could not be considered satisfactory. The general character of the prevalent diseases has been maintained, and, as in previous years, malaria accounted for the greatest number of cases of illness in the island. No disease broke out in epidemic form and plague may be considered to have disappeared from the colony. The number of patients admitted to the Civil Hospital in Port Louis, which has 290 beds, was 6595, the number discharged 6205, and the daily average in hospital 257; there were 384 deaths. The total number treated in the seven district hospitals was 13,656. Outlying areas are served by dispensaries for the treatment of emergency and pauper cases. There were 68 inmates in the Leper Asylum at the close of the year. Sir H. Hesketh Bell, K.C.M.G., the Governor, writes: "The general health of the colony still leaves much to be desired. Although plague has been stamped out and antimalarial works are showing a very beneficial effect, the death-rate of the island is far higher than it should be. The City of Port Louis especially is very unhealthy and shows a mortality of over 5 per cent. per annum. There can be no doubt that the high price of all food is reacting injuriously on the health of the labouring classes, and that in many cases there is an impaired power of resistance to many diseases which, under better conditions, would not prove fatal. It is almost needless to say that the improvement of sanitary conditions and the provision of good supplies of water are subjects which chiefly engross my attention, and I trust that, in spite of the enormous increase in the cost of cement and all other materials, progress will gradually continue to be made."

Barbados.—The population on Dec. 31st, 1917, was estimated at 186,656—males, 80,335; females, 106,321. The birth-rate per 1000 in 1917 was 28·8 and the death-rate 24·9. Illegitimate births numbered 3527, or 65·6 per cent. of the total births. The death-rate of children under the age of 1 year was 289 per 1000. At the General Hospital the daily average of in-patients was 160, and the total of out-patients for the year was 32,599. In the Lazaretto the average daily number of patients resident was 149. In the Lunatic Asylum the average daily number of inmates was 400. Continued beneficial results were obtained in the case of pellagra patients, a special diet having been instituted for their treatment.

East Africa Protectorate.—It appears from the report for 1916–17 that in the Coast zone 6089 cases of malaria were treated, with 16 deaths. There were 2 cases of blackwater fever. Among the native general population (including Asiatics) 24 cases of filariasis came under notice; this disease is said to be very common in Tanaland, but few persons suffering from it present themselves for treatment. Seven cases, all fatal, of cerebro-spinal meningitis were reported. The number of dysentery cases was 498, of which 30 resulted fatally. Of the 13 European cases all recovered. There were 10 cases of enteric, 4 of whom were officials, whilst 6 were members of the general European population; there were 2 deaths. Two fresh cases of leprosy were reported. No cases of plague came under treatment. All the small-pox cases, 71 in number, occurred amongst Africans, 23 of whom died. One case of beri-beri came under treatment, and amongst Africans 3 cases of tetanus, 1 ending fatally.—In the Mountainous zone there were 6144 malarial cases, 17 cases of blackwater fever, 1 case of filariasis, and 1 of dengue. Seventy-two cases of cerebro-spinal meningitis, with 31 deaths, occurred amongst the native general population and none amongst Europeans. There were 269 pneumonia cases, with 64 deaths, mostly amongst Africans. Venereal cases included 392 of syphilis, 3 being fatal, and 324 of gonorrhœa. The occurrence of 59 scurvy cases was noted, with 2 deaths.—In Kenya and Nyanza Provinces there were 5304 cases of malaria (including 71 European admissions to hospital), as against 4687 of the previous year. There were 6 cases of beri-beri and 19 cases of cerebro spinal meningitis (with 14 deaths). One European case of plague ended fatally, and there were 18 deaths in 33 cases amongst other nationalities. Of 630 small-pox cases amongst the native population 212 resulted fatally. There were 5 fatal cases of syphilis out of 292 cases, yaws increased from 126 to 146 cases, and there were 3 cases of tetanus with 1 death.—In the Desert zone the number of admissions for malaria was 1548. There were 12 cases of beri-beri and 90 (3 fatal) of dysentery. No cases of blackwater fever, cerebro-spinal meningitis, small-pox, or leprosy were reported.

LA PERDITA SANITARIA.

THE *Italia Sanitaria* has published some interesting statistics on the losses of the Italian medical services during the war. Altogether 377 doctors lost their lives, of whom 327 belonged to the regular services and 42 to the Italian Red Cross. In addition are many priests, pharmacists, and others, and—sad augury for the future of Italian medicine—no less than 216 medical students. Of the total losses of 1051 killed, about 300 had received decorations for proficiency or valour.

THE FRESH AIR FUND.

Lord Downham, of Fulham, Chairman of the London County Council, has sent us an urgent appeal on behalf of the Children's Country Holiday Fund, under the auspices of which many of our elementary school children are enabled to enjoy a most necessary change of air and scene. "The strain and stress of the war have abated," he says, "but the necessity for the children's health and strength to be rebuilt still remains." This Fund year by year does excellent work in providing joy and sunshine for those who most need them and so preventing a great deal of sickness, always latent in London slums, from ripening into the hospital stage of development. Donations should be made payable to the Children's Country Holiday Fund, 18, Buckingham street, Strand, W.C.2.

SPARE TIME SERVICE OF THE R.A.M.C.

IN France, as in England, the civilian population has had to suffer deprivations through the mobilisation of doctors. In many parts of the war zone there were no civilian practitioners left, and this was almost invariably the case in the rural districts that had been recaptured from the enemy. The Army doctors of all the Allied nations came with great willingness to the help of those brave villagers who fell ill in their war-stricken homes. An interesting account of his civilian practice has reached us from an English major who has been engaged in this extra-official service.

"The civilians began to come back," he says, "about the middle of November, many of them suffering from influenza which they had caught during the evacuation. The crowding together in barns and in canal barges had spread scabies widely and also, to a lesser extent, tinia circinata among all classes of the community. Various nervous troubles were manifested by a number of these people in consequence of what they had gone through, and in the aged cardiac incompetence was not at all infrequent; it was accompanied by dropsy and proved very fatal. The exposure and hardship precipitated uræmia in a certain number of old kidney cases, and these also failed to respond to treatment.

In December measles appeared among the children, and also a few cases of diphtheria (verified bacteriologically) and of scarlet fever, but these conditions were kept in check and did not—so far as I know—spread to any of the troops in the vicinity.

I have personally attended between 1100 and 1200 cases of illness of the most diverse sorts among civilians, returned prisoners of war, and French and Belgian soldiers home on leave. These cases have each been paid anything from one to over a hundred visits in the course of their illnesses, and I have had on one occasion as many as 45 *new cases* coming to me in a single day, my record for a single morning's work being 95 patients. I soon found it impossible to pay all the visits asked of me, and had to refuse to be called out at night.

I have had two local well waters examined by our mobile laboratory. Each was found grossly polluted, notices condemning them were put up, and the Maire informed. Various civilians have come to me with wounds due to tampering with shells and anti-aircraft explosive bullets abandoned by the Germans in their retreat; the Maire, at my request, sent round the town-crier to warn the population against these dangers. I have attended cases from 14 different villages, and have found the work extremely interesting."

E. T. B.—An unqualified person may not call himself a pharmacist, but as the law stands at present he may call his place of business a pharmacy. The case Pharmaceutical Society *v.* Mercer, 1908, bears on the point.

MANAGER'S NOTICE.

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METEOROLOGICAL OFFICE

Advisory Committee on Atmospheric Pollution

REPORT ON OBSERVATIONS IN THE YEAR 1917-1918

Forming the Fourth Report of the Committee for the Investigation of Atmospheric Pollution

INTRODUCTION.

The final observations from the reporting stations upon which this report is based were received on Nov. 15th, 1918.

The Committee note with satisfaction that the number of observing stations has not fallen off during this year. There are now 24, and it is hoped that on the resumption of peace conditions further stations will be established.

The classification of results and the method of treatment adopted follow the lines of the Committee's last Report. The methods of observation and analysis remain the same also. For the explanation of the units used in the classification, reference must be made to the Committee's Second Report.

In view of the shortage of paper and the necessity for economising energy the Committee have not repeated in the present Report the full lists in detail of figures of monthly deposit from various stations. These have already been published in THE LANCET, and reference can be made to them if required. The following is a list of the dates of the issues in which the returns may be found :—

Return for—									
April, 1917.	Published in	THE	LANCET	of	Oct.	23rd,	1917.		
May,	,,	,,	,,	,,	,,	,,	,,	,,	
June,	,,	,,	,,	,,	Feb.	9th,	1918.		
July,	,,	,,	,,	,,	,,	,,	,,		
Aug.,	,,	,,	,,	,,	Mch.	9th,	,,		
Sept.,	,,	,,	,,	,,	,,	,,	,,		
Oct.,	,,	,,	,,	,,	July	27th,	,,		
Nov.,	,,	,,	,,	,,	,,	,,	,,		
Dec.,	,,	,,	,,	,,	Aug.	17th,	,,		
Jan., 1918.	,,	,,	,,	,,	,,	,,	,,		
Feb.,	,,	,,	,,	,,	Jan.	11th,	1919.		
Mch.,	,,	,,	,,	,,	,,	,,	,,	,,	

Full returns are given for two stations which have been selected as giving the lowest and highest total deposits for the year.

List of tables.—The tables published in this Report are practically similar to those in the Third Report, and a list is given below :—

1. Monthly deposit for two selected stations—i.e., Newcastle-on-Tyne and Malvern. The gauge at Newcastle-on-Tyne gives about the highest and Malvern the lowest deposit among the stations for which complete and reliable analyses are available.

2. Total solids deposited monthly at all stations.

3. Mean monthly deposits at all stations for the half year April to September, 1916 and 1917.

4. The same as No. 3, but for the half year October to March, 1916-17, and 1917-18.

5 and 6. Classification of the elements of pollution under Groups A, B, C, and D for same periods as in Nos. 3 and 4.

7 and 8. Totals of Classes A, B, C, and D for each element of pollution for all stations and for summer and winter months. These are prepared from Nos. 5 and 6, and cover the same period.

9. Comparison of mean monthly deposit during summer and winter.

10. Average deposit for each element of pollution for each month for the following groups of stations :—
   (*a*) All stations as given in Table VII.
   (*b*) Three London stations.
   (*c*) Nine Glasgow stations.

The returns for this year from some of the stations must be regarded as of somewhat doubtful value. This is in some cases owing to artificial pollution arising from the conditions of exposure, neighbourhood of trees, and other causes. In others the shortage of bottles due to war conditions made it necessary to use less satisfactory

TABLE I.—*Monthly Deposit at Two Selected Stations, Newcastle-on-Tyne and Malvern.*

—	Station.	Rainfall in millimetres.	Metric tons per square kilometre.								
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.		
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).
1917.											
April	Newcastle-on-Tyne	81	0·65	10·75	23·70	2·90	6·28	44·28	3·12	0·63	0·09
,,	Malvern	36	—	0·25	0·41	0·64	1·28	2·60	0·59	0·18	F.T.
May	Newcastle-on-Tyne	65	0·15	3·60	8·36	1·95	5·58	19·64	2·85	0·46	0·12
,,	Malvern	95	—	0·21	0·48	1·44	3·01	5·15	1·21	0·33	0·03
June	Newcastle-on-Tyne	31	0·13	4·26	10·82	1·25	3·61	20·07	1·91	0·33	0·14
,,	Malvern	54	—	0·26	0·61	0·38	1·28	2·55	0·43	0·15	0·02
July	Newcastle-on-Tyne	29	0·29	4·25	10·37	1·83	3·08	19·81	1·55	0·32	0·13
,,	Malvern	42	—	0·18	0·25	0·82	1·69	2·96	0·74	0·18	0·02
Aug.	Newcastle-on-Tyne	182	0·13	4·19	10·35	5·81	7·99	28·50	3·80	0·77	0·49
,,	Malvern	142	—	0·23	1·13	0·64	1·94	3·94	1·08	0·15	0·07
Sept.	Newcastle-on-Tyne	35	0·08	4·72	12·51	1·40	3·22	21·93	1·42	0·21	0·07
,,	Malvern	46	—	0·08	0·08	0·43	0·74	1·34	0·38	0·07	0·01
Oct.	Newcastle-on-Tyne	53	0·16	4·49	7·19	2·23	3·62	17·70	1·88	0·45	0·09
,,	Malvern	72	—	0·15	0·43	0·38	0·56	1·52	0·36	0·15	Trace
Nov.	Newcastle-on-Tyne	23	0·10	3·31	8·04	1·45	2·20	15·10	1·15	0·37	0·02
,,	Malvern	22	—	0·05	0·12	0·41	1·15	1·75	0·36	0·15	0·01
Dec.	Newcastle-on-Tyne	56	0·22	4·34	10·47	2·37	3·39	20·80	1·82	0·88	0·09
,,	Malvern	24	—	0·04	0·10	1·15	2·03	3·34	0·82	0·41	0·01
1918.											
Jan.	Newcastle-on-Tyne	58	0·39	3·26	4·56	2·69	3·62	14·52	1·78	0·83	0·08
,,	Malvern	69	—	0·05	0·07	0·69	2·06	2·90	0·79	0·28	0·01
Feb.	Newcastle-on-Tyne	28	0·03	2·80	4·25	1·45	2·67	11·19	1·07	0·63	0·12
,,	Malvern	28	Trace	0·07	0·28	0·33	0·99	1·67	0·43	0·10	0·01
Mar.	Newcastle-on-Tyne	26	0·31	3·70	7·43	1·77	2·91	16·11	1·46	0·50	0·10
,,	Malvern	33	F.T.	0·07	0·25	0·28	0·93	1·54	0·41	0·07	0·01

methods of collection, such as open-necked carboys placed under the outlets from gauge vessels; this called for greater attention than it was always possible to give, with the result that errors due to loss of water, or in some cases to the drip from the outside of the gauge basin getting into the bottle, have to be considered probable.

Any such results which were considered to be of doubtful accuracy have been marked in the tables by an asterisk in front of the name of the station, and have not been used in preparing Tables VII., VIII., and X., or in the graphs Figs. 1 and 2.

Steps have been taken to assure, as far as possible, the elimination of such causes of inaccuracy in the future.

In Table X., for more accurate comparison, the deposit has been reduced to a standard 30-day month.

If reference be made to Tables IX. and X. of the Committee's Third Report it will be noted that the figures in Table X. give practically the same information as in Table IX., but in the former the figures for deposit were reduced to a mean daily deposit for each element for each month, the object being to compare the deposits at different periods of the year with due allowance for the variation in the number of days in the month.

If the deposit in February, with 28 days, be compared with the deposit in January, with 31 days, strictly speaking the former should be increased by about 10 per cent., and a similar correction of about 3 per cent. should be made in comparing months of 30 days with those of 31 days. After further consideration of the best means of dealing with this difficulty, it was decided that a table showing the mean monthly deposit of each element of pollution for certain groups of stations should be given, but that the months should be reduced to a standard of 30 days, so as to make the figures for deposit strictly comparable in all cases. Table X. is therefore prepared on these lines. No correction is required in making a comparison between the six summer and six winter months, since, although the number of days in the months varies, the number in the six summer months—i.e., April to September—is 183, while in the six winter months—i.e., October to March—it is 182 in ordinary years and 183 in leap years.

In many cases it has been found that the returns for rainfall as obtained in the Committee's deposit gauges differ from the figures obtained in standard rain-gauges in the same district, as published in the Monthly Weather Report of the Meteorological Office. When there is any considerable variation the observing station is communicated with and their attention drawn to this, so that should there be any explanation forthcoming it can be placed upon record. Since many of the Committee's gauges are set up in cities, the nature of the exposure, height above ground, and other conditions affecting the amount of rain recorded are not similar in every case to the conditions holding for the rain-gauges of the Meteorological Office; also it is rarely the case that the two gauges compared are set up on the same site. For these reasons it is to be expected that a certain amount of variation in the quantity of rain received would be found, especially in summer when local thunderstorms are common.

TABLE II.—*Total Solids Deposited Monthly at all Stations, in Metric Tons per Square Kilometre.*

Station.	1917.									1918.			Mean monthly deposit for year.
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
Leicester	17·21	16·70	16·61	9·16	19·76	10·82	13·66	7·78	8·23	15·96	25·74	5·24	13 91
London:—													
Meteorological Office..	12·96	8 09	9 38	11·51	16·20	6·18	12·53	6·97	11·10	17·67	9·61	10·56	11·07
*Embankment Gardens	16·58	37·70	11·72	28·26	20·59	—	34 66	24·25	—	19·73	26·49	21·89	24·19
*Finsbury Park	15·70	6·61	29·82	15·11	21·75	10·45	14·05	10·81	16·79	14·16	17·68	5·01	14·83
*Ravenscourt Park ...	23·37	15·03	16·64	17·36	16·87	14·10	12·49	7·53	4·75	11·79	8·85	1·72	12·55
*Southwark Park... ...	11·76	36·33	11·55	13·56	16·86	12·11	35·78	20·28	—	10·22	15·12	6·77	17·33
Wandsworth Common	7·23	4·84	2·47	10·00	3·73	3·96	2·81	—	—	2·61	2·16	14·08	5·40
Golden Lane	9·09	14·64	11·85	18·13	15·87	9·46	17·62	9·59	12·62	16·27	9·59	10·60	12·95
Malvern	2·60	5·15	2·55	2·96	3·94	1·34	1·52	1·75	3·34	2·90	1·67	1·54	2·61
Manchester:—													
Queen's Park...	10·44	13·30	15·70	6·20	14·30	11·50	14·40	10·90	4·20	4·90	5·70	5·01	9·72
School of Technology..	12·72	15·60	11·40	14·50	21·80	18·20	21·00	13·20	5·20	11·40	10·60	12·50	14·01
Newcastle-on-Tyne ...	44·28	19·64	20·07	19·81	28·50	21·93	17·70	15·10	20·80	14·52	11·19	16·11	20·81
†Rochdale	—	34·60	34·60	34·63	34·63	34·63	35·69	35·69	35·69	—	33·95	33·95	34·81
*St. Helens	24·50	17·53	14·02	16·84	32·13	13·94	—	22·60	15·16	22·68	25·11	19·31	20·40
Coatbridge	10·64	19·06	16·55	15·78	18·61	14·29	20·04	—	14·52	18·39	17·74	13·69	16·35
Glasgow:—													
Alexandra Park	7·69	20·18	13·54	9·72	12·40	10·60	19·52	13·03	11·82	17·84	11·56	—	13·56
Bellahouston Park ...	11 86	19·22	19·98	10·63	10·04	7·55	14·43	11·79	—	14·91	12·86	9·94	13·00
Blythswood Square ...	13·75	23·26	31·30	10·90	15·64	11·34	18·30	15·67	13·14	—	14·82	11·24	16·17
Botanic Gardens	11·56	21·20	16·25	11·46	11·97	10·58	—	16·41	14·41	—	15·17	13·34	14·34
Richmond Park	7·55	23·82	14·21	10·98	15·39	12·43	17·65	16·83	13·57	29·33	13·28	12·15	15·60
Ruchill Park	13·43	16·53	18·11	8·44	17·60	9·76	16·61	11·44	14·11	—	12·12	21·04	14·52
South Side Park	4·89	13·20	15·20	10 50	9·96	10·26	12·13	7·53	10·55	19·76	12·97	15·53	11·88
Tollcross Park	—	16·58	27 82	10·79	—	7·74	25·49	18·28	14·91	—	13·85	10·17	16·14
Victoria Park...	5·69	17·95	15·40	9·04	9·00	8·77	—	14·35	—	17·78	17·11	11·88	13·13

* See p. 2. † Collection of deposit made quarterly.

LIST OF STATIONS.

A list of the observing stations is given below, showing in each case the position of the deposit gauge and the nature of the exposure.

LEICESTER.

The gauge is situated on the ground-level in an open space surrounded on three sides by streets and on the fourth by a large warehouse frontage. The neighbourhood is thickly populated, and within 500 yards of the gauge are gas works, a refuse destructor, and a tramway power-station. On one side, about 40 yards distant, there are stocks of coal and engine slack.

LONDON.

Meteorological Office.—This is the Committee's gauge and is situated on the roof of the Meteorological Office at South Kensington.

Embankment Gardens.—The gauge is on the ground-level, but is surrounded by trees, and the leaves are sometimes found in the basin of the gauge. It is possible that the proximity to the Strand somewhat increases the deposit.

Finsbury Park.—The gauge is on the ground-level in the park. It is separated from the main road on the N.E. by a fence 5 ft. 6 in. high situated 2 ft. 6 in. from the gauge. On the S.E. there is a tree the branches of which reach to within 6 ft. of the gauge. Some dust probably reaches the gauge from the main road. The neighbourhood is open.

Ravenscourt Park.—This gauge is within enclosed ground on the ground-level. It is faced by tall houses on the east, a 9 ft. brick wall on the south, and fairly tall trees border three sides of the ground. The gauge receives sometimes a small amount of leaves and twigs.

Southwark Park.—This gauge is on the ground-level and is not exposed to any dirt arising from the traffic. It is situated in the open park.

Victoria Park.—The gauge is on the ground-level in the centre of the Botanical Gardens. It is not sheltered in any way. The park is surrounded by large factories, including chemical, and a densely populated area, especially on the S. and S.W., the direction of the prevalent winds. A heavy deposit of soot is found on the trees and shrubs, and a thick film is usually on the three lakes in the park, especially during foggy weather.

Wandsworth Common.—The gauge is situated on the ground-level and is not sheltered in any way. Within 200 yards of it is the L.B. & S.C.R. main line, and it is possible that, with the wind in the right direction, smoke and dirt from the engines may increase the deposit.

Golden Lane.—The gauge is fixed on the flat roof of a depôt of the Corporation. The roof is 52 ft. 6 in. above ground-level. The gauge is not sheltered in any way, nor is it exposed to any special sources of pollution.

MALVERN.

The gauge is fixed at Malvern Wells on the ground-level 681 ft. above sea-level. The district round is open for miles to the east, but there are hills on the other aspects about 300 yards from the gauge. There are no houses or roads in the vicinity. This gauge is representative of uncontaminated country air.

TABLE III.—SUMMER RESULTS.

Comparison of Mean Monthly Deposit for each Station for Half Years April to September, 1916 and 1917.

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.			Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition	Ash.	Total solids.	Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	1916	42	0·11	3·26	4·27	1·40	2·59	11·63	1·18	0·39	0·14	6
	1917	57	0·13	3·42	7·15	1·53	2·82	15·04	1·47	0·44	0·19	6
London :—												
Meteorological Office ...	1916	55	0·06	1·89	3·95	1·37	3·82	11·06	1·41	0·67	0·07	6
	1917	83	0·10	1·42	3·30	2·02	3·87	10·72	1·56	0·63	0·15	6
*†Embankment Gardens	1916	32	0·27	5·40	8·39	2·34	4·41	20·81	2·10	0·51	0·13	4
	1917	64	0·29	4·61	8·34	3·42	6·31	22·97	3·41	0·84	0·19	5
*Finsbury Park	1916	58	0·12	1·75	7·30	1·25	3·48	13·90	1·55	0·29	0·04	6
	1917	76	0·09	2·63	8·01	2·05	3·80	16·57	2·16	0·55	0·09	6
*Ravenscourt Park ...	1916	57	0·15	1·95	5·06	1·41	4·40	12·97	1·89	0·32	0·11	6
	1917	86	0·29	2·71	8·80	1·98	3·46	17·23	1·93	0·55	0·13	6
*Southwark Park	1916	44	0·06	2·89	7·60	1·67	4·05	16·27	2·05	0·38	0·08	6
	1917	48	0·04	2·27	6·71	2·83	5·18	17·03	2·89	0·65	0·12	6
Wandsworth Common	1916	34	0·02	1·26	4·78	1·42	3·12	10·56	1·34	0·31	0·05	6
	1917	33	0·02	0·24	0·78	2·05	2·29	5·37	1·10	0·32	0·05	6
Golden Lane	1916	56	0·07	2·33	3·54	1·97	3·23	11·14	2·06	0·59	0·22	6
	1917	70	0·06	2·29	4·80	2·03	4·01	13·17	2·01	0·69	0·26	6
Malvern	1916	41	0·00	0·18	0·28	0·41	0·99	1·87	0·49	0·10	0·02	6
	1917	69	0·00	0·20	0·49	0·73	1·66	3·09	0·74	0·18	0·03	6
Manchester :—												
Queen's Park	1916	61	—	—	—	—	—	13·83	—	—	—	6
	1917	59	—	—	—	—	—	11·91	—	—	—	6
School of Technology ...	1916	56	—	—	—	—	—	20·42	—	—	—	6
	1917	65	—	—	—	—	—	15·70	—	—	—	6
‡Newcastle-on-Tyne ...	1916	52	0·29	4·19	9·52	1·85	4·77	20·62	2·28	0·40	0·08	5
	1917	71	0·24	5·30	12·69	2·52	4·96	25·71	2·44	0·45	0·17	6
Rochdale	1916	71	—	—	—	—	—	29·57	—	—	—	6
	1917	—	—	—	—	—	—	34·62	—	—	—	5
*§St. Helens	1916	—	—	—	—	—	—	—	—	—	—	—
	1917	68	0·29	3·33	8·03	2·18	6·00	19·83	2·72	1·23	0·22	6
Coatbridge	1916	79	0·09	1·46	4·01	1·43	3·66	10·65	1·62	0·41	0·13	6
	1917	63	0·10	1·98	6·75	2·29	4·71	15·82	2·51	0·27	0·20	6
Glasgow :—												
Alexandra Park	1916	75	0·11	1·74	2·76	3·67	5·87	14·15	3·40	0·38	0·25	6
	1917	51	0·47	2·03	4·81	1·45	3·60	12·36	1·76	0·15	0·16	6
Bellahouston Park ...	1916	78	0·06	1·14	2·05	1·85	3·07	8·16	1·88	0·18	0·12	6
	1917	60	0·26	2·45	5·05	1·22	4·23	13·21	1·70	0·15	0·10	6
Blythswood Square ...	1916	74	0·23	3·25	7·76	3·20	4·80	19·25	3·18	0·23	0·15	6
	1917	61	0·23	2·54	6·19	4·39	4·35	17·70	2·25	0·19	0·20	6
Botanic Gardens	1916	83	0·08	1·27	1·80	2·63	4·59	10·38	2·39	0·24	0·13	6
	1917	76	0·28	2·24	4·36	1·92	5·04	13·84	2·40	0·17	0·16	6
Richmond Park	1916	82	0·09	1·41	2·72	2·14	4·13	10·48	2·59	0·22	0·17	6
	1917	61	0·23	1·68	6·38	1·73	4·04	14·06	2·15	0·17	0·17	6
Ruchill Park	1916	81	0·08	1·39	2·98	2·13	3·83	10·42	2·54	0·19	0·17	6
	1917	68	0·21	2·02	5·96	1·45	4·34	13·98	2·07	0·15	0·12	6
South Side Park	1916	82	0·09	0·85	1·80	1·92	3·26	7·93	1·92	0·18	0·13	6
	1917	61	0·16	1·60	3·28	1·50	4·14	10·67	1·69	0·10	0·08	6
¶Tollcross Park	1916	80	0·08	1·34	3·00	2·51	4·54	11·46	2·45	0·21	0·14	6
	1917	52	0·21	1·89	7·52	1·50	4·62	15·73	2·37	0·13	0 10	4
Victoria Park	1916	86	0·08	0·81	1·34	2·95	3·94	9·12	2·67	0·18	0·22	6
	1917	66	0·25	1·40	4·09	1·70	3·54	10·98	1·87	0·11	0·17	6

* See p. 2. † 1916: Four months only. *August*, no returns. *September*, collected from 20th only. 1917: Five months only. *September* omitted owing to large amount of ash attributed to abnormal dust. ‡ 1916: Five months only. *July*, results lost through accident. § St. Helens commenced observations January, 1917. ¶ 1917: Four months only. *April*, sample lost owing to an accident. *August* results unreliable, boys having thrown stones into gauge.

TABLE IV.—WINTER RESULTS.

Comparison of Mean Monthly Deposit for Each Station for Half Years October to March, 1916–17, and 1917–18.

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.			Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.	Total solids.	Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	1916–17	43	0·10	3·20	5·70	1·29	2·66	12·95	1·43	0·39	0·15	6
	1917–18	28	0·19	2·71	4·22	1·28	4·37	12·77	2·55	0·31	0·09	6
London:—												
Meteorological Office	1916–17	54	0·10	2·07	3·85	2·75	3·34	12·06	1·53	0·97	0·05	6
	1917–18	42	0·14	2·18	3·50	1·44	4·15	11·41	1·46	0·63	0·05	6
*Embankment Gardens	1916–17	32	0·51	3·41	8·52	2·50	4·86	19·59	2·37	0·59	0·05	6
	1917–18	43	0·14	2·76	5·48	4·92	12·10	25·40	5·69	1·50	0·24	5**
*Finsbury Park	1916–17	49	0·10	1·54	4·61	2·66	5·17	14·08	3·[illegible]	0·50	0·04	6
	1917–18	48	0·10	1·08	4·26	2·49	5·16	13·08	3·2[illegible]	0·54	0·06	6
*Ravenscourt Park	1916–17	63	0·23	1·99	4·90	3·19	6·13	16·42	3·39	0·68	0·09	6
	1917–18	31	0·06	1·15	3·68	1·10	1·87	7·86	1·27	0·27	0·08	6
*Southwark Park	1916–17	49	0·15	2·75	5·38	3·53	6·42	18·23	3·61	0·90	0·07	6
	1917–18	38	0·04	1·67	8·21	2·79	4·92	17·63	2·97	0·63	0·10	**
Wandsworth Common	1916–17	30	0·03	0·76	2·41	1·16	2·76	7·11	1·43	0·31	0·02	3
	1917–18	24	0·02	0·52	2·33	0·79	1·78	5·42	0·98	0·28	0·04	4†**
Golden Lane	1916–17	53	0·07	2·49	3·45	1·83	4·21	12·04	2·03	0·91	0·18	6
	1917–18	43	0·11	2·50	4·25	1·82	4·04	12·72	1·85	0·86	0·28	6
Malvern	1916–17	41	0·01	0·23	0·79	0·80	2·18	4·02	0·78	0·25	0·01	3
	1917–18	41	—	0·07	0·21	0·54	1·29	2·12	0·53	0·19	0·01	6
Manchester:—												
Queen's Park	1916–17	62	—	—	—	—	—	14·41	—	—	—	6
	1917–18	70	—	—	—	—	—	7·52	—	—	—	6
School of Technology	1916–17	58	—	—	—	—	—	18·87	—	—	—	6
	1917–18	54	—	—	—	—	—	12·32	—	—	—	6
Newcastle-on-Tyne	1916–17	64	0·28	4·66	11·36	3·04	6·50	25·83	2·66	1·97	0·10	6
	1917–18	41	0·20	3·65	6·99	1·99	3·07	15·90	1·53	0·61	0·08	6
Rochdale	1916–17	—	—	—	—	—	—	19·18	—	—	—	6
	1917–18	—	—	—	—	—	—	35·00	—	—	—	5**
*St. Helens	1916–17	72	0·49	6·37	9·68	3·53	17·61	37·67	6·40	3·09	0·28	3
	1917–18	71	0·59	4·13	6·07	3·09	7·10	20·97	3·89	1·86	0·33	5‡
Coatbridge	1916–17	70	0·20	2·29	5·93	2·02	4·11	14·55	2·04	0·47	0·16	6
	1917–18	61	0·10	2·03	5·47	2·93	6·35	16·88	3·22	0·58	0·21	5**
Glasgow:—												
Alexandra Park	1916–17	71	0·12	1·60	3·06	3·12	5·18	13·06	3·09	0·43	0·20	6
	1917–18	87	0·18	2·38	4·58	2·02	5·61	14·75	2·92	0·43	0·19	5§
Bellahouston Park	1916–17	77	0·11	1·83	2·25	2·47	4·91	11·57	3·06	0·49	0·10	6
	1917–18	99	0·12	1·37	2·84	3·39	5·07	12·79	3·25	0·58	0·14	5¶
Blythswood Square	1916–17	76	0·16	2·45	3·14	2·90	5·28	13·76	2·76	0·82	0·16	6
	1917–18	99	0·17	2·14	4·10	1·65	6·58	14·63	3·43	0·51	0·21	5‖
Botanic Gardens	1916–17	92	0·21	2·49	3·49	4·26	8·28	18·74	4·28	0·48	0·15	6
	1917–18	90	0·28	0·90	4·73	3·15	5·77	14·83	4·15	0·41	0·12	4**¶
Richmond Park	1916–17	78	0·12	1·36	2·91	2·28	5·09	11·77	3·59	0·38	0·18	6
	1917–18	93	0·22	2·45	6·50	2·88	5·09	17·14	3·31	0·29	0·27	6
Ruchill Park	1916–17	76	0·17	1·30	2·51	2·57	6·47	13·02	2·62	0·42	0·14	6
	1917–18	92	0·28	1·73	4·46	2·60	6·00	15·06	3·36	0·50	0·14	5**
South Side Park	1916–17	76	0·10	0·93	2·15	2·06	4·30	9·55	2·42	0·35	0·11	6
	1917–18	102	0·18	0·23	4·14	2·15	4·38	13·08	2·72	0·33	0·12	6
Tollcross Park	1916–17	77	0·15	1·39	2·54	2·58	4·90	11·56	3·11	0·42	0·17	6
	1917–18	91	0·26	1·88	5·45	3·76	5·18	16·54	3·44	0·40	0·13	5**
Victoria Park	1916–17	82	0·10	1·19	2·39	2·89	4·71	11·28	2·77	0·35	0·26	6
	1917–18	93	0·17	1·55	4·09	3·30	6·18	15·28	3·56	0·37	0·20	4¶

* See p. 2. ** Bottle broken Coatbridge in November; London (Embankment Gardens, Southwark Park, Wandsworth Common) in December; Rochdale, Glasgow (Botanic Gardens, Ruchill Park, Tollcross Park), in January. † No returns in November. ‡ Sample lost in transit, October. § Carboy empty when received in laboratory, March. ‖ Results unreliable, January. ¶ Abnormal owing to large amount of sandy matter, Glasgow, Botanic Gardens and Victoria Park in October; Bellahouston Park and Victoria Park in December.

TABLE V.—*Classification (Summer Months), April to September, 1917.*

Station.	Metric tons per square kilometre.										Summary.				No. of months.
	Insoluble matter.				Soluble matter.		Total solids.	Included in soluble matter.							
	Rainfall in mm.	Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	A	B	C	D	
Leicester	57	B	C	C	B	B	C	B	B	C	0	5	4	0	6
London:—															
Meteorological Office	83	B	B	B	B	B	B	B	B	C	0	8	1	0	6
*Embankment Gardens	64	D**	C**	C	C**	C†	C	C†	B**	C	0	1	7	1	5
*Finsbury Park	76	B	B	C	B	B	C	B	B	B	0	7	2	0	6
*Ravenscourt Park ...	86	D**	B	C**	B	B	C	B	B	B	0	6	2	1	6
*Southwark Park ...	48	A	B	C	C	C	C	B**	B	B	1	4	4	0	6
Wandsworth Common	33	A**	A**	A**	B	B**	B**	B**	B	B**	3	6	0	0	6
Golden Lane	70	B	B	B	B	B	B	B	B	D†	0	8	0	1	6
Malvern	69	A†	A†	A†	A†	B†	A†	A†	A	A†	8	1	0	0	6
Manchester:—															
Queen's Park	59	—	—	—	—	—	B	—	—	—	0	1	0	0	6
School of Technology	65	—	—	—	—	—	C	—	—	—	0	0	1	0	6
Newcastle-on-Tyne ...	71	C	D†	D†	C	C	D**	B	B	C	0	2	4	3	6
Rochdale	—	—	—	—	—	—	D†	—	—	—	0	0	0	1	5
*St. Helens	68	D**	C	C	B	C**	C	B	C†	C**	0	2	6	1	6
Coatbridge	63	B	B	C	C	C	C	B	A	C	1	3	5	0	6
Glasgow:—															
Alexandra Park ...	51	D†	B	B	B	B	B	B	A	C	1	6	1	1	6
Bellahouston Park ...	60	D	B	B	B**	B	B	B	A	B	1	7	0	1	6
Blythswood Square...	61	C	B	C	D†	B	C	B	A	C	1	3	4	1	6
Botanic Gardens ...	76	D	B	B	B	C	B	B	A	C	1	5	2	1	6
Richmond Park ...	61	C	B	C	B	B	B	B	A	C	1	5	3	0	6
Ruchill Park	68	C	B	B	B	B	B	B	A	B	1	7	1	0	6
South Side Park ...	61	C	B	B	B	B	B	B	A†	B	1	7	1	0	6
Tollcross Park	52	C	B	C	B	C	C	B	A	B	1	4	4	0	4
Victoria Park	66	D	B	B	B	B	B	B	A**	C	1	6	1	1	6

* See p. 2. ** Indicates the stations with the second highest or lowest record for each element.

† Indicates the stations with the highest or lowest record for each element.

MANCHESTER.

Queen's Park.—The gauge is on the ground-level in a park, which has a high altitude compared with other portions of the city. It is on the ground-level. The park is surrounded by a residential district, and there are also a number of factory chimneys in the vicinity.

School of Technology.—The gauge is in the garden on the ground-level, surrounded by the College and warehouse property.

NEWCASTLE-ON-TYNE.

The gauge is on the ground-level, about 60 ft. or 70 ft. above sea-level, on a low platform, which raises the rim of the gauge to about 7 ft. from the ground.

ROCHDALE.

The gauge is situated on some vacant land, about 350 ft. above sea-level. The land adjoins the buildings of the Technical School.

ST. HELENS.

This gauge is on the ground-level in the centre of the town, in the parade ground at the rear of the Town Hall. The position is not sheltered and the gauge is not exposed to abnormal dirt.

COATBRIDGE.

The gauge is placed upon the flat roof of a cinema house. The height of the roof from the street is 31 ft. The position is open and not exposed to any abnormal dirt. It is situated almost in the middle of the town.

GLASGOW.

Alexandra Park.—The gauge is on the ground-level in an enclosed part of the park. The district is an industrial one. There are iron and steel works to the N.W., and a gas works to the N. of the gauge, both about 300 yards distant. The exposure is good and there is no shelter.

Bellahouston Park.—The gauge is on the ground-level in the open park in a good situation, but at a considerable height above the general level of the city. There are trees in the neighbourhood, but none nearer than about 20 yards. The exposure is good and there is no shelter.

Blythswood Square.—The gauge is on the ground-level in the open square. The exposure is good and there is no shelter or abnormal pollution.

Botanic Gardens.—The gauge is situated in the gardens on the ground-level, but is in a somewhat sheltered position, being about 15 yards south of a house, and with trees in the immediate neighbourhood, but not overhanging.

TABLE VI.—*Classification (Winter Months), October, 1917, to March, 1918.*

Station.	Metric tons per square kilometre.										Summary.				No. of months.
	Rainfall in mm.	Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.							
		Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	A	B	C	D	
Leicester	28	C	B	B	B	B	B	B	B	B	0	8	1	0	6
London :—															
Meteorological Office	42	B	B	B	B	B	B	B	B	B	0	9	0	0	6
*Embankment Gardens	43	B	B	B	D**	D*	D†	D**	D†	C	0	3	1	5	5
*Finsbury Park ...	48	B	B	B	C	C	B	C	B	B	0	6	3	0	6
*Ravenscourt Park...	31	B	B	B	B	B	B	B	A†	B	1	8	0	0	6
*Southwark Park ...	38	A	B	C**	C	C	C	B	B	B	1	4	4	0	5
Wandsworth Common	24	A†	A†	B†	B†	B†	B†	A†	A	A†	5	4	0	0	4
Golden Lane	43	B	B	B	B	B	B	B	B	D†	0	8	0	1	6
Malvern	41	A**	A**	A**	A**	A**	A**	A**	A**	A**	9	0	0	0	6
Manchester :—															
Queen's Park	70	—	—	—	—	—	B	—	—	—	0	1	0	0	6
School of Technology	54	—	—	—	—	—	B	—	—	—	0	1	0	0	6
Newcastle-on-Tyne ...	41	C	C†	C†	B*	B	C	B	B	B	0	5	4	0	6
Rochdale	—	—	—	—	—	—	D**	—	—	—	0	0	0	1	5
*St. Helens	71	D**	C**	C	C	C†	C	C	D**	D**	0	0	6	3	5
Coatbridge	61	B	B	B	C	C	C	C	B	C	0	4	5	0	5
Glasgow :—															
Alexandra Park ...	87	C	B	B	B	C	B	B	B	C	0	6	3	0	5
Bellahouston Park ...	99	B	B	B	C	C	B	C	B	B	0	6	3	0	5
Blythswood Square...	99	C	B	B	B	C	B	C	B	C	0	5	4	0	5
Botanic Gardens ...	90	D†	A	B	C	C	B†	C†	B	B	1	4	3	1	4
Richmond Park ...	93	C	B	C	C	C	C	C	A	D	1	1	6	1	6
Ruchill Park	92	D†	B	B	C	C	C	C	B	B	0	4	4	1	5
South Side Park ...	102	C	B	B	B	B	B	B	B	B	0	8	1	0	6
Tollcross Park	91	D	B	B	D†	C	C	C	B	B	0	4	3	2	5
Victoria Park	93	C	B	B	C	C	C	C	B	C	0	3	6	0	4

* See p. 2. ** Indicates the stations with the highest or lowest record for each element.

† Indicates the station with the second highest or lowest record for each element.

Richmond Park.—The gauge is on the ground-level in the open park, with good exposure. There are no trees in the neighbourhood. There are iron, steel, and chemical works on all sides, but none nearer than about three-quarters of a mile.

Ruchill Park.—The gauge is on the ground-level. The neighbourhood is partly industrial. The exposure is good. There are no trees in the neighbourhood, nor any sources of abnormal pollution. The gauge is situated on a hill above the surrounding city.

Southside Park (or Queen's Park).—The gauge is on the ground-level in a good open position. There are no trees in the neighbourhood, but a few shrubs about 10 ft. away to the north. The district is residential. There are no large factories nearer than about two miles to the east.

Tollcross Park.—The gauge is situated on the ground-level, and is in a good position in the open park. There are a few shrubs in the neighbourhood, but none overhanging.

Victoria Park.—The gauge is on the ground-level in a residential district, almost in the country. The exposure is good. There is no shelter or source of abnormal pollution.

It should be noted that where the gauge is standing on ground-level the rim of the actual collecting vessel is 4 ft. above this.

RESULTS OF YEAR 1917–18.

Comparison with Previous Figures.

Referring now to Tables III. and IV., we may compare the year 1917–18 with 1916–17. Owing, however, to the number of elements into which the deposit has been analysed, it would occupy too much space to discuss each of these separately, and this is really unnecessary, since the relation between the two years is obvious from the tables. Table III. compares the two summers and Table IV. the two winters. It will be of interest, however, to compare the two years on the basis of total solids deposited, and for this purpose the stations have been analysed into two groups—those in which the deposit has increased and those in which it has diminished; and lists are given below in which the stations are thus grouped.

Total Solids Deposited in the Summer Months of 1917 expressed as Percentages of Deposit in 1916.

Deposit.	
Increased in 1917.	Diminished in 1917.
Leicester 129	London:—
London:—	Meteorological Office ... 97
*Embankment Gardens 114	Wandsworth Common. 51
*Finsbury Park 119	Manchester:—
*Ravenscourt Park ... 133	School of Technology... 75
*Southwark Park 105	Queen's Park... 86
Golden Lane 118	Glasgow:—
Malvern 165	Alexandra Park 87
Newcastle-on-Tyne 124	Blythswood Square ... 92
Rochdale 117	
Coatbridge 148	
Glasgow:—	
Bellahouston Park ... 162	
Botanic Gardens 133	
Richmond Park 134	
Ruchill Park 134	
South Side Park 135	
Tollcross Park 137	
Victoria Park 120	

* See p. 2.

Comparison of Total Solids Deposited in the Winter Months of 1917–18 expressed as Percentages of Deposit in 1916–17.

Deposit.	
Increased in 1917-18.	Diminished in 1917-18.
London:—	London:—
*Embankment Gardens 130	Meteorological Office.. 95
Golden Lane 105	*Finsbury Park 93
Coatbridge 116	*Ravenscourt Park ... 48
Rochdale 182	*Southwark Park... ... 97
Glasgow:—	Wandsworth Common 76
Alexandra Park 113	Malvern 53
Bellahouston Park ... 110	Manchester:—
Blythswood Square ... 106	Queen's Park 52
Richmond Park 145	School of Technology 65
Ruchill Park 115	Newcastle-on-Tyne ... 62
South Side Park... ... 138	*St. Helens 56
Tollcross Park 143	Glasgow:—
Victoria Park 135	Botanic Gardens ... 79

* See p. 2.

If we look first at the relation between the total solids deposited in the summer months of the two years it is obvious from the list above that the majority of stations show a considerable increase in the amount of deposit. Reference to the Report for last year will show

TABLE VII.—*Comparison of Totals of Classes A, B, C, D for Each Element of Pollution for the Two Half Years, April–September, 1916 and 1917, for 16 Stations.*

TABLE VIII.—*Totals of Classes A, B, C, D for Each Element of Pollution for the Two Half Years, October–March, 1916–17 and 1917–18, for 16 Stations.*

TABLE VII.

	—	—	A	B	C	D
	Total solids	1916	1	13	2	0
		1917	1	10	4	1
Insoluble.	Tar	1916	2	12	1	1
		1917	2	4	6	4
	Carbonaceous other than tar...	1916	3	10	3	0
		1917	2	12	1	1
	Ash	1916	4	10	2	0
		1917	2	8	5	1
Soluble.	Loss on ignition...	1916	1	10	5	0
		1917	1	12	2	1
	Ash	1916	1	10	5	0
		1917	0	12	4	0
	Sulphuric acid	1916	1	13	2	0
		1917	1	15	0	0
	Chlorine...	1916	8	8	0	0
		1917	11	5	0	0
	Ammonia	1916	1	9	5	1
		1917	1	5	9	1

TABLE VIII.

	—	—	A	B	C	D
	Total solids	1916–17	1	13	1	1
		1917–18	1	9	6	0
Insoluble.	Tar	1916–17	2	8	5	1
		1917–18	2	4	7	3
	Carbonaceous other than tar...	1916–17	3	11	2	0
		1917–18	3	12	1	0
	Ash	1916–17	1	14	0	1
		1917–18	1	13	2	0
Soluble.	Loss on ignition...	1916–17	0	6	9	1
		1917–18	1	8	6	1
	Ash	1916–17	0	7	8	1
		1917–18	1	6	9	0
	Sulphuric acid	1916–17	1	10	5	0
		1917–18	2	6	8	0
	Chlorine...	1916–17	1	12	2	1
		1917–18	3	13	0	0
	Ammonia	1916–17	2	5	8	1
		1917–18	2	8	4	2

List of Stations used in Tables VII. and VIII.

Leicester.
London:—
Meteorological Office.
Wandsworth Common.
Golden Lane.
Malvern.
Newcastle-on-Tyne.
Coatbridge.
Glasgow:—
Alexandra Park.
Bellahouston Park.
Blythswood Square.
Botanic Gardens.
Glasgow—(*Continued*):—
Richmond Park.
Ruchill Park.
South Side Park.
Tollcross Park.
Victoria Park.

also that a similar increase of deposit during the summer months was noticeable in 1916–17 as compared with 1915–16.

Referring now to the list comparing the two winters, we see that there are about an equal number of stations showing increased and diminished deposit. If, however, the Glasgow, London, and Manchester stations be grouped together and averaged for each city respectively, it then becomes obvious that the number of stations showing a diminished deposit in 1917–18 considerably exceeds those showing an increase. Grouped in this way we might say that three places show increased deposit in the winter of 1917–18, while six show a diminished deposit. Referring again to the Committee's Third Report, it will be seen that the conditions are somewhat similar to those of the previous two years. It would seem, therefore, that there is some indication of an improvement in the state of the atmosphere during the winter months, but that the degree of pollution during the summer months is on the increase.

Taking the three most reliable stations operating in London—i.e., omitting those marked by asterisks—and the nine Glasgow stations, it will be useful to consider these cities independently.

Of the three London stations, one shows increased deposit in the summer months of 1917 compared with 1916, two a diminished deposit. In the winter of the same years the state of affairs is the same, two stations showing a diminished and one an increased deposit. This points towards an improvement of the air in both the winter and the summer months. It must be remembered, however, that during the summer the sources of pollution are quite different from the sources in the winter months, dust raised by the wind preponderating in summer, while during the winter the smoke of fires plays a greater part.

Comparing the last four years in London on the basis of the mean monthly deposit of total solids in tons per square kilometre for the whole year for the Meteorological Office and Golden Lane stations, both of which give full continuous records of a reliable nature, and both have similar exposures on roofs, we obtain the following figures: 1914–15, 12·35; 1915–16, 14·16; 1916–17, 11·57; 1917–18, 12·01.

Turning now to a consideration of the Glasgow stations. Here we find that in nearly all cases there is an indication of increased pollution of the air during both summer and winter. Seven out of the nine stations show increase in the summer months and eight out of nine increase in the winter months.

In Tables V. and VI. the stations are classified under the letters A, B, C, and D, the units used being the same as in the Committee's Second Report. The classification is based upon Tables III. and IV., and is for the same periods, the figure used being the mean monthly deposit for each half year. Tables VII. and VIII., which are prepared from a group of 16 stations working over the whole period, give the totals of the different classes A, B, C, and D for each element of pollution; while in a further table VII. and VIII. have been reduced by the addition of the A's and B's and C's and D's, and the results are given in the following table.

Comparison of Deposits for 1916–17 with 1917–18.

			April to Sept. (16 stations).		Oct. to March (16 stations).	
			A & B.	C & D.	A & B.	C & D.
Insoluble.	Total solids ...	1916–1917	14	2	14	2
		1917–1918	11	5	10	6
	Tar	1916–1917	14	2	10	6
		1917–1918	6	10	6	10
	Carbonaceous other than tar	1916–1917	13	3	14	2
		1917–1918	14	2	15	1
	Ash	1916–1917	14	2	15	1
		1917–1918	10	6	14	2
Soluble.	Loss on ignition	1916–1917	11	5	6	10
		1917–1918	13	3	9	7
	Ash	1916–1917	11	5	7	9
		1917–1918	12	4	7	9
	Sulphates... ...	1916–1917	14	2	11	5
		1917–1918	16	0	8	8
	Chlorine	1916–1917	16	0	13	3
		1917–1918	16	0	16	0
	Ammonia... ...	1916–1917	10	6	7	9
		1917–1918	6	10	10	6

As explained in previous Reports, the figures representing the sum of the A's and B's and C's and D's may be used to compare the quantity deposited in the periods considered. An increase in the sum of the A's and B's represents a diminution of deposit, while an increase in the sum of C's and D's represents increase of deposit. As the sum of the C's and D's varies directly with the amount of deposit, it will be more convenient to use this figure than that for the A's and B's. Comparing the two years 1916–17 and 1917–18 on this basis, we find the following results:—

Taking the whole group of stations and considering each element of pollution: During the summer of 1917–18 there was an increase in the deposit of Total Solids, Tar, Insoluble Ash, and Ammonia, while there was a diminution in the deposit of carbonaceous matter other than Tar, Soluble Loss on Ignition, Soluble Ash, and Sulphates; Chlorine Deposit was the same for both summers.

Comparing the winter months for the two years, we find an increase in Total Solids, Tar, Insoluble Ash, and Sulphates, while there was a reduction in the deposit of Carbonaceous Matter other than Tar, Soluble Loss on Ignition, Chlorine, and Ammonia, the Soluble Ash being the same for both years.

Carbonaceous matter thus shows a diminution in the deposit during the summer and winter months. Insoluble Ash shows a great increase during the summer months and a slighter increase during the winter months of the two periods. Sulphates, which are derived mainly from combustion products, show a diminution during the summer months and an increase during the winter months of the two periods. This is probably explainable on the basis that less fuel was consumed in 1917–18 than in 1916–17.

TABLE IX.—*Comparison of Mean Monthly Deposit for Summer and Winter Months of the Year 1917–18.*

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphates (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	Apl.-Sep.	57	0·13	3·42	7·15	1·53	2·82	15·04	1·47	0·44	0·19	6
	Oct.-Mch.	28	0·19	2·71	4·22	1·28	4·37	12·77	2·55	0·31	0·09	6
London—												
Meteorological Office	Apl.-Sep.	83	0·10	1·42	3·30	2·02	3·87	10·72	1·56	0·63	0·15	6
	Oct.-Mch.	42	0·14	2·18	3·50	1·44	4·15	11·41	1·46	0·63	0·05	6
*Embankment Gardens	Apl.-Sep.	64	0·29	4·61	8·34	3·42	6·31	22·97	3·41	0·84	0·19	5
	Oct.-Mch.	43	0·14	2·76	5·48	4·92	12·10	25·40	5·69	1·50	0·24	5
*Finsbury Park	Apl.-Sep.	76	0·09	2·63	8·01	2·05	3·80	16·57	2·16	0·55	0·09	6
	Oct.-Mch.	48	0·10	1·08	4·26	2·49	5·16	13 08	3·25	0·54	0·06	6
*Ravenscourt Park	Apl.-Sep.	86	0 29	2·71	8·80	1·98	3·46	17·23	1·93	0·55	0·13	6
	Oct.-Mch.	31	0·06	1·15	3·68	1·10	1·87	7·86	1·27	0·27	0·08	6
*Southwark Park	Apl.-Sep.	48	0·04	2·27	6·71	2·83	5·18	17·03	2·89	0·66	0·12	6
	Oct.-Mch.	38	0·04	1·67	8·21	2·79	4·92	17·63	2·97	0·63	0·10	5
Wandsworth Common	Apl.-Sep.	33	0·02	0·24	0·78	2·05	2·29	5·37	1·10	0·32	0·05	6
	Oct.-Mch.	24	0·02	0·52	2·33	0·79	1·78	5·42	0·98	0·28	0·04	4
Golden Lane	Apl.-Sep.	70	0·06	2·29	4·80	2·03	4·01	13·17	2·01	0·69	0·26	6
	Oct.-Mch.	43	0·11	2·50	4·25	1·82	4·04	12·72	1·85	0·86	0·28	6
Malvern	Apl.-Sep.	69	Nil	0·20	0·49	0·73	1·66	3 09	0·74	0·18	0·03	6
	Oct.-Mch	41	Nil	0·07	0·21	0·54	1·29	2·12	0·53	0·19	0·01	6
Manchester—												
Queen's Park	Apl.-Sep.	59	—	—	—	—	—	11·91	—	—	—	6
	Oct.-Mch.	70	—	—	—	—	—	7·52	—	—	—	6
School of Technology	Apl.-Sep.	65	—	—	—	—	—	15·70	—	—	—	6
	Oct.-Mch.	54	—	—	—	—	—	12·32	—	—	—	6
Newcastle-on-Tyne	Apl.-Sep.	71	0·24	5·30	12·69	2·52	4·96	25·71	2·44	0·45	0·17	6
	Oct.-Mch.	41	0·20	3·65	6·99	1·99	3·07	15·90	1·53	0·61	0·08	6
Rochdale	Apl.-Sep.	—	—	—	—	—	—	34·62	—	—	—	5
	Oct.-Mch.	—	—	—	—	—	—	35·00	—	—	—	5
*St. Helens	Apl.-Sep.	68	0·29	3·33	8·03	2·18	6 00	19·83	2·72	1·23	0·22	6
	Oct.-Mch.	71	0·59	4·13	6·07	3·09	7·10	20·97	3·89	1·86	0·33	5
Coatbridge	Apl.-Sep.	63	0·10	1·98	6·75	2·29	4·71	15·82	2·51	0·27	0·20	6
	Oct.-Mch.	61	0·10	2·03	5 47	2·93	6·35	16·88	3·22	0·58	0·21	5
Glasgow—												
Alexandra Park	Apl.-Sep.	51	0·47	2·03	4·81	1·45	3·60	12·36	1·76	0·15	0·16	6
	Oct.-Mch.	87	0·18	2·38	4·58	2·02	5·61	14·75	2·92	0·43	0·19	5
Bellahouston Park	Apl.-Sep.	60	0·26	2·45	5 05	1·22	4·23	13·21	1·70	0·15	0·10	6
	Oct.-Mch.	99	0·12	1·37	2·84	3·39	5·07	12·79	3·25	0·58	0·14	5
Blythswood Square	Apl.-Sep.	61	0·23	2·54	6·19	4·39	4·35	17·70	2·25	0·19	0·20	6
	Oct.-Mch.	99	0·17	2·14	4·10	1·65	6·58	14·63	3·43	0·51	0·21	5
Botanic Gardens	Apl.-Sep.	76	0·28	2·24	4·36	1·92	5·04	13·84	2·40	0·17	0·16	6
	Oct.-Mch.	90	0·28	0·90	4·73	3·15	5·77	14·83	4·15	0·41	0·12	4
Richmond Park	Apl.-Sep.	61	0·23	1·68	6 38	1·73	4·04	14·06	2·15	0·17	0·17	6
	Oct.-Mch.	93	0·22	2·45	6·50	2·88	5·09	17·14	3·31	0·29	0·27	6
Ruchill Park	Apl.-Sep.	68	0·21	2·02	5·96	1·45	4·34	13·98	2·07	0·15	0·12	6
	Oct.-Mch.	92	0·28	1·73	4·46	2·60	6·00	15·06	3·36	0·50	0·14	5
South Side Park	Apl.-Sep.	61	0·16	1·60	3·28	1·50	4·14	10·67	1·69	0·10	0·08	6
	Oct.-Mch.	102	0·18	2·23	4·14	2·15	4·38	13·08	2·72	0·33	0·12	6
Tollcross Park	Apl.-Sep.	52	0·21	1·89	7·52	1·50	4·62	15·73	2·37	0·13	0·10	4
	Oct.-Mch.	91	0·26	1·88	5·45	3·76	5·18	16·54	3·44	0·40	0·13	5
Victoria Park	Apl.-Sep.	66	0·25	1·40	4 09	1·70	3·54	10·98	1·87	0·11	0·17	6
	Oct.-Mch.	93	0·17	1·55	4·09	3·30	6·18	15·28	3·56	0·37	0·20	4

* See p. 2.

COMPARISON OF STATIONS.

In the following list the mean monthly deposits for the whole year and for different stations are compared.

Highest and Lowest Mean Monthly Deposits in 1917–18, in Tons per Square Kilometre.

	Highest.		Lowest.	
Total solids...	Rochdale	34·81	Malvern ...	2·61
	*London—Embankment Gardens ...	24·19	London—Wandsworth Common ...	5·39
Tar...	*St. Helens	0·42	Malvern ...	0
	Glasgow—Alexandra Park	0·34	London—Wandsworth Common...	0·02
Carbonaceous other than tar	Newcastle	4·47	Malvern ...	0·14
	*St. Helens	3·69	London—Wandsworth Common ...	0·35
	*London—Embankment Gardens ...	3·69		
Ash (insoluble)..	Newcastle	9·84	Malvern ...	0·35
	*London—Southwark Park	7·39	London—Wandsworth Common...	1·40
Soluble loss on ignition	*London—Embankment Gardens ...	4·17	Malvern ...	0·63
	Glasgow—Blythswood Square... ...	3·14	Leicester ...	1·41
Ash (soluble) ...	*London—Embankment Gardens ...	9·20	Malvern ...	1·47
	*St. Helens	6·50	London—Wandsworth Common..	2·08
Sulphates ...	*London—Embankment Gardens ...	4·55	Malvern ...	0·63
	*St. Helens	3·25	London—Wandsworth Common..	1·05
Chlorine ...	*St. Helens	1·52	Malvern ...	0·18
	*London—Embankment Gardens ...	1·17	Glasgow—South Side Park... ...	0·22
			Victoria Park... ...	0·22
Ammonia ...	*St. Helens and Golden Lane, London	0·27	Malvern ...	0·02
	*Embankment Gardens, London, and Richmond Park, Glasgow..	0·22	London—Wandsworth Common.	0·05

* See p. 2.

It is curious to observe that in several instances a London station appears as giving the highest and lowest deposits for the year. Rochdale only appears once—i.e., as giving the highest deposit of Total Solids for the year. In this connexion it must be pointed out that the returns from Rochdale did not give an analysis of the deposit, hence the only figure available was that for Total Solids.

Malvern, as in previous years, shows consistently the lowest deposit of all elements of pollution. The second lowest in seven cases out of nine was Wandsworth Common, London.

SEASONAL VARIATIONS.

In Table IX. is given a comparison of the mean monthly deposits during summer and winter, and this table has been further summarised below, omitting doubtful figures.

Comparison of Summer and Winter Deposits for Year April, 1917, to March, 1918.

—	Winter deposit greater in:	Deposits equal.	Summer deposit greater in:
	Stations.		Stations.
Rainfall	10 (9 Glasgow).	—	8
Total solids...	11	—	8
Insoluble (Tar...	6	4	6
Insoluble (Carbonaceous	8	—	8
Insoluble (Ash...	5	1	10
Soluble (Loss on ignition	9	—	7
Soluble (Ash	13	—	3
Sulphates	11	—	5
Chlorine	13	1	2
Ammonia	10	—	6

Referring to the summary and considering each of the elements of pollution separately, we find the following results:—

Rainfall.—Out of 18 stations, 10 show greater rainfall in winter, and in 8 the summer rainfall was the greater. Of the 10 stations mentioned 9 were in the Glasgow District, so that we have the curious condition brought out that the summer rainfall was greater than the winter.

Total Solids.—Total solids show a greater deposit in winter in 11 stations out of the 19, whereas the summer deposit was greater in 8.

Tar.—Out of 16 stations, 6 showed a greater winter deposit, 6 a greater summer deposit, and in 4 stations the deposit was the same during summer and winter. This is curious considering that tar has its origin in the combustion of fuel.

Carbonaceous Matter.—Out of 16 stations, 8 give a greater winter deposit and 8 a greater summer deposit. Carbonaceous matter, although it includes soot from the burning of fuel, also covers matter of vegetable origin which may be carried by the wind from fields, trees, and road surfaces.

Insoluble Ash.—Out of 16 stations, 5 give a greater winter deposit, 10 a greater summer deposit, and in one station the deposits in summer and winter were equal. Remembering that the production of dust during summer is much greater than during winter, the above result is to be expected. Although during the summer the rainfall was greater than in winter it does not follow that the ground surface was kept in a damp condition in summer, which is the controlling factor in the prevention of dust.

Soluble Loss on Ignition and Ash, Sulphates, Chlorine, and Ammonia, all show a greater winter deposit.

It will now be of interest to examine the incidence of deposit in the different months of the year, and for this purpose reference is to be made to Table X.

Table X. has been prepared for three groups of stations:

(*a*) A group of 16, including all the stations giving a complete analysis—this includes Glasgow and London.

(*b*) A group of 3 London stations.

(*c*) 9 Glasgow stations.

An analysis of Table X. has been prepared for the groups of stations given showing for each element the month of highest and lowest deposit. This analysis is given below.

TABLE X.—*Average Deposit of Each Element of Pollution for Each Month Reduced to a Standard of 30 Days for the Following Groups: (a) 16 Stations; (b) 3 London Stations; (c) 9 Glasgow Stations.*

(a) 16 Stations.

Deposit in Tons per Square Kilometre.

		1917.								1918.			Ratio Max. / Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm. ...	36	68	62	56	103	45	91	90	51	73	80	29	3·56
	Total solids	12·03	15·70	15·70	10·90	13·45	9·81	14·51	11·89	12·15	15·16	13·50	11·42	1·60
Insoluble.	Tar	0·12	0·23	0·29	0·21	0·08	0·13	0·10	0·15	0·17	0 16	0·26	0·14	3·63
Insoluble.	Carbonaceous matter	2·14	2·00	2·41	1·89	2·07	1·58	2·10	1·41	1·89	2·59	1·84	1·87	1·84
Insoluble.	Ash	5·16	6·25	6 60	3·85	4·85	3·84	4·35	3·10	4·14	4·75	4·45	4·55	2·13
	Total insoluble ...	7·42	8·48	9·30	5·95	7·00	5·55	6·55	4·66	6·20	7·50	6·55	6·56	2·00
Soluble.	Loss on ignition...	1·36	2·03	2·61	1·70	1·99	1·43	2·66	2·90	1·45	2·44	1·83	1·75	2·13
Soluble.	Ash	3·25	5·23	3·79	3·25	4·46	2·83	5·30	4·36	4·51	5·23	5·09	3·12	1·88
	Total soluble ...	4·61	7·26	6·40	4·95	6·45	4·26	7·96	7·42	5 96	7·67	6·92	4·87	1·87
	Sulphates	1·69	2·32	1·79	1·54	2·27	1·43	2·75	2·60	2·39	2·94	3·10	1·64	2·17
	Chlorine...	0·34	0·31	0·22	0·21	0·34	0·18	0·70	0·34	0·39	0·40	0·62	0·27	3·90
	Ammonia	0·10	0·20	0·19	0·13	0·17	0 07	0·15	0·13	0·10	0·19	0·20	0 09	2·86

(b) 3 London Stations.

Deposit in Tons per Square Kilometre.

		1917.								1918.			Ratio Max. / Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm. ...	41	49	61	72	104	37	58	36	25	52	21	23	4·96
	Total solids... ...	9·76	8·89	7·90	12·79	11·53	6·53	10·63	8·28	11·48	11·79	7·62	11·38	1·96
Insoluble.	Tar	0·06	0·06	0·07	0·06	0·07	0·03	0·05	0·10	0·11	0·15	0·09	0·10	5·00
Insoluble.	Carbonaceous matter...	1·01	1·18	1·30	1·62	1·40	1·26	1·71	1·72	2·49	1·76	1·46	2·18	2·47
Insoluble.	Ash	4·04	3·83	2·17	3·15	2·54	1·71	2·41	2·29	3·74	4·44	2·36	5·03	2·94
Insoluble.	Total insoluble matter...	5·11	5·07	3·54	4·82	4·00	3·00	4·15	4·10	6·32	6·34	3·91	7·31	2·44
Soluble.	Loss on ignition ...	1·45	1·14	2·09	3·63	2·60	1·02	2·05	1·39	1·32	1·18	1·36	1·10	3·56
Soluble.	Ash	3·20	2·70	2·27	4·32	4·93	2·51	4·44	2·79	3·84	4 27	2·36	2·95	2·17
Soluble.	Total soluble matter...	4·65	3·83	4·36	7·94	7·53	3·53	6·48	4·18	5·16	5·45	3·71	4·05	2·25
	Sulphates	1·56	1·39	1·11	1·73	2·30	1·04	1·98	1·27	1·50	1·78	1·04	1·14	2·21
	Chlorine	0 73	0·50	0·45	0·53	0·73	0·26	0·52	0·52	0·76	0·78	0·53	0·59	3·00
	Ammonia	0·10	0·16	0·20	0·20	0·19	0·07	0·12	0·05	0·10	0·11	0·32	0·07	5·33

(c) 9 Glasgow Stations.

Deposit in Tons per Square Kilometre.

		1917.								1918.			Ratio Max. / Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm	28	76	68	58	77	47	117	124	69	105	117	33	4·44
	Total Solids... ...	9·55	18·47	19·09	9 95	12·34	9·89	17·16	13·93	12·80	19·28	14·72	12·73	2·02
Insoluble.	Tar	0·10	0·35	0·45	0·32	0·06	0·20	0·11	0·20	0·24	0·11	0·36	0·16	7·50
Insoluble.	Carbonaceous matter...	1·50	2·17	2·71	1·90	1·97	1·41	2·09	1·30	1·71	3·27	1·61	1·90	2·52
Insoluble.	Ash	3·50	6·99	8·15	3·44	4·77	3·66	4·84	3·05	4·21	5·71	5·04	5·04	2·67
Insoluble.	Total insoluble matter...	5·10	9·50	11·31	5·65	6·82	5·27	7·04	4·54	6·15	9·10	7·00	7·10	2·50
Soluble.	Loss on ignition ...	1·17	2·45	3·25	1·18	1·44	1·53	3·50	3·89	1·27	3·50	1·98	2·23	3·32
Soluble.	Ash	3·28	6·55	4·52	3·10	4·07	3·10	6·63	5·49	5·37	6·60	·75	3·42	2·14
Soluble.	Total soluble matter...	4·45	9·00	7·78	4·27	5·52	4·62	10·12	9·38	6·63	10·20	7·73	5·65	2·39
	Sulphates	1·71	2·64	2·07	1·57	2·18	1·60	3·61	3·45	3·05	4·11	3·82	1·98	2·62
	Chlorine	0·19	0·20	0·12	0·87	0·14	0·14	0·81	0·32	0·20	0·18	0·74	0·16	7·25
	Ammonia	0·11	0·24	0·19	0·11	0·13	0·06	0·17	0·19	0·14	0·30	0·19	0·09	5·00

Analysis of Table X. showing Months of Highest and Lowest Deposit for Each Element of Pollution.

		(a) 16 Stations.				(b) 3 London Stations.				(c) 9 Glasgow Stations.			
	—	Highest.	Second highest.	Lowest.	Second lowest.	Highest.	Second highest.	Lowest.	Second lowest.	Highest.	Second highest.	Lowest.	Second lowest.
	Rainfall	Aug.	Oct.	March.	April.	Aug.	July.	Feb.	March.	Nov.	Oct. & Feb.	April.	March.
	Total solids ...	May & June.	Jan.	Sept.	July.	July.	Jan.	Sept.	Feb.	Jan.	June.	,,	Sept.
Insoluble.	Tar	June.	Feb.	Aug.	Oct.	Jan.	Dec.	,,	Oct.	June.	Feb.	Aug.	April.
Insoluble.	Carbonaceous matter	Jan.	June.	Nov.	Sept.	Dec.	March.	April.	May.	Jan.	June.	Nov.	Sept.
Insoluble.	Ash	June.	May.	,,	,,	March.	Jan.	Sept.	June.	June.	May.	,,	July.
	Total insoluble ...	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	,,	April.
Soluble.	Loss on ignition	Nov.	Oct.	April.	,,	July.	Aug.	,,	March.	Nov.	Oct. & Jan.	April.	July.
Soluble.	Ash	Oct.	Jan. & May.	Sept.	March.	Aug.	Oct.	June.	Feb.	Oct.	Jan.	July & Sept.	April.
	Total soluble ...	,,	Jan.	,,	April.	July.	Aug.	Sept.	,,	Jan.	Oct.	July.	,,
	Sulphates	Feb.	,,	,,	July.	Aug.	Oct.	Sept. & Feb.	June.	,,	Feb.	,,	Sept.
	Chlorine	Oct.	Feb.	,,	,,	Jan.	Dec.	Sept.	,,	July.	Oct.	June.	Aug. & Sept.
	Ammonia	May & Feb.	Jan. & June.	,,	March.	Feb.	June & July.	Nov.	Sept. & March.	Jan.	May.	Sept.	March.

The above analysis speaks for itself, but it will be of interest to compare the group of London with the group of Glasgow stations as representing typical English and Scotch cities. In all the elements we find the months of maximum and minimum deposits are different for the two groups of stations. If we look at the deposits of total insoluble and soluble matter we find that in the Glasgow group of stations insoluble matter shows its maximum deposit during the summer months, whereas the total soluble matter shows its maximum during the winter months. There is no sign of such a seasonal variation in the London group. It must, however, be noted that while all the Glasgow gauges are on the ground level, two of the three London gauges are on the roofs of houses, and thus raised above one of the sources of summer deposit—i.e., dusty streets or roads.

Sulphates in two groups have their maximum deposit in the winter months.

Ammonia cannot be said to show any indication of being either specially a summer or winter product.

RELATION OF DEPOSITS.

It was fairly proved from the results of the previous years that there was no relationship to be discovered between the deposit of Insoluble Matter and the amount of rainfall. Curves were plotted bringing out this; which was also demonstrated by reducing the deposit for each month to a standard rainfall of 100 mm., when it was found that the variation between the highest and lowest figures had become more pronounced instead of their being made more uniform. The case of soluble matter was, however, found to be different, and the Committee considered that this required further investigation. It will be remembered that there was an indication of a direct relation between soluble deposits and rainfall.

In considering this relation reference should be made to Table X. and the curves Figs. 1 and 2. In Fig. 1 the rainfall, soluble loss on ignition and soluble ash are plotted together, and it will be seen from this how closely the curves resemble each other. The unit for rainfall is, however, different from that used for the soluble deposits.

In Fig. 2 the total soluble matter for the three groups (*a*), (*b*), and (*c*) of Table X. is plotted for each group against the rainfall.

While the deposit of soluble matter is not strictly proportionate to the rainfall, it is obvious from Fig. 2 that there is a general tendency to vary directly with the rainfall. The variations between different months are, however, so great as to make it impossible to deduce any exact relationship. On the curve Fig. 2, group (*a*), a straight line has been drawn which fairly averages all the observations and gives, with some approach to accuracy, the nature of the relation between the deposit of soluble matter and rainfall. If we call rainfall R and the deposit of total soluble matter S, the former in mm., the latter in tons per square kilometre, then the relation may be roughly expressed by the following formula:—

$$S = 0{\cdot}058\ R + 2{\cdot}5.$$

To ascertain if this relation held good in previous years the total soluble matter was plotted over rainfall for 1915–16, using a group of 23 stations, and for 1916–17 using a group of 18 stations. The formulæ for these two years were:—

$$1915\text{–}16 \ldots \ \ldots \quad S = 0{\cdot}045\ R + 3{\cdot}2$$

$$1916\text{–}17 \ldots \ \ldots \quad S = 0{\cdot}047\ R + 3{\cdot}2$$

It is not suggested that this expression can be used to find the soluble deposit when the rainfall is known—the curves of deposit, as shown in Fig. 2, are too erratic; but it does appear to show

FIG. 1.—*Curves of Average Deposit of each Element of Pollution for each Month for Group of 16 Stations.*

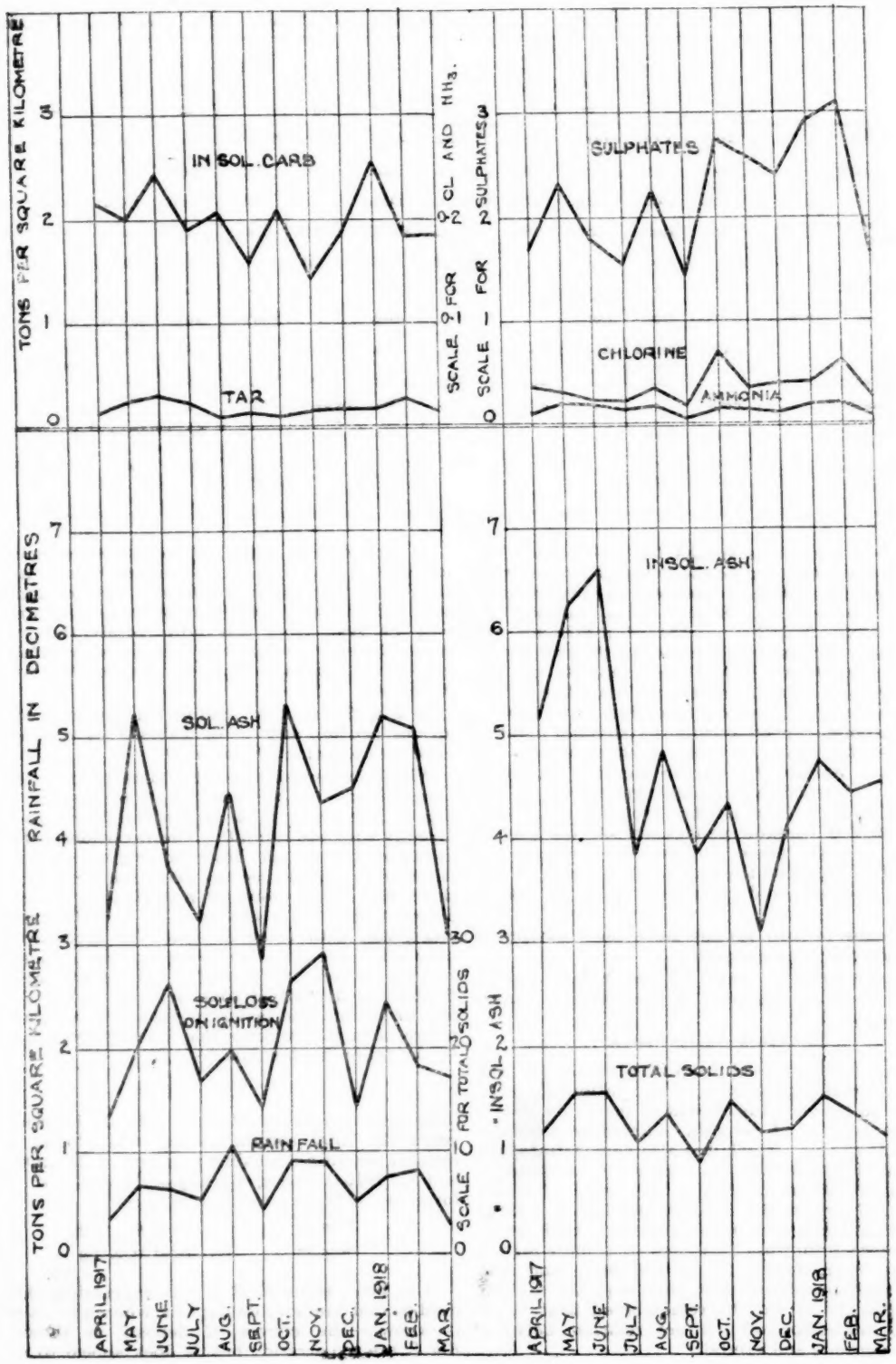
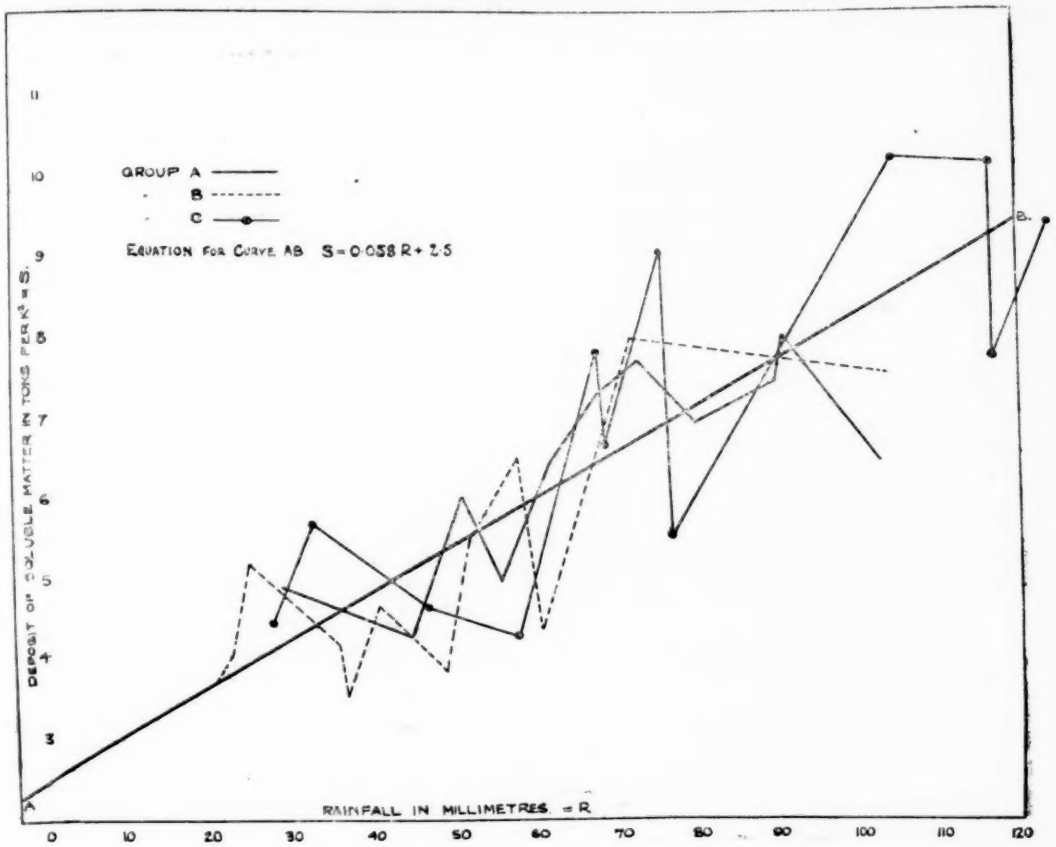


FIG. 2.—*Average Deposit of Soluble Matter for Groups A, B, and C on Table 10 Plotted against Average Rainfall.*



the nature of the relationship between soluble deposit and rainfall. The slope of the curve given by "0·058 R" is not constant in the years examined, and the "+ 2·5" also varies. Its meaning is probably that in the absence of rainfall, during dry weather, there is still a deposit of soluble matter.

The relation of the various elements of deposit to each other is brought out in Table X. and Fig. 1. Sulphates, chlorine, and ammonia vary more or less together, and this is to be expected, as they all form part of the soluble deposit, which is to a great extent governed by the rainfall. None of the other deposits appear to show any special relation to each other.

COMPOSITION OF RAINFALL IN GEORGETOWN, BRITISH GUIANA.

Some notes have been kindly communicated to the Committee by the Hon. J. B. Harrison, C.M.G., Director of Botany, on observations made on the composition of rainfall samples taken at the Botanical Gardens eastward of Georgetown, Demerara. As representing entirely different conditions from those holding in the United Kingdom, the Committee have thought it advisable to include these notes in the present Report. The rain was collected in a funnel on a tower and the height of the top of the funnel is 42 ft. from the ground-level, and the tower is situated about one and a half miles from the seashore, whilst there are very few buildings between the tower and the coast-line in the direction of the continuously prevailing east-north-east trade-winds, none of them being more than 18 ft. to 20 ft. in height, and the nearest land in this direction is the shore of Morocco at a distance of about 3000 nautical miles. There can be little doubt that the solids contained in the rain-waters collected are those normal to the rains of the trade-winds, with perhaps some derived from the coastal sea-spray.

The average results over the two years 1916 and 1917 were as follows:—

	Solids in solution.		Solids in solution.
Ca	7·95	Cl_2	33·93
Mg	3·44	SO_4	12·02
K	2·77	CO_3	9·78
Na	16·36	NO_3	11·57
Al_2O_3	0·58	NH_4	0·12
Fe_2O_3	1·97		100·69
SiO_2	0·20		

Some SiO_2 is always present in combination with Al_2O_3, probably in suspension as very finely divided clay. The mean salinity of the rain-water was 9·29 mg. per litre, and the annual rainfall was 88·95 in.

The constituents in solution are subject to great variation; for instance, in the quarterly rainfalls there have been the following variations:—

	Maximum.	Minimum.
Rainfall	30·00 (762 mm.)	13·99 (356 mm.)
	Milligrammes per litre.	
Ca	1·279	0·514
Mg	0·490	0·025
K	0·507	0·060
Na	4·468	0 489
Al_2O_3...	0·380	Nil.
Fe_2O_3	0·380	Nil.
Cl_2	9·027	1·500
SO_4	1·983	0 868
CO_3	1·100	0 330
NO_3	3·500	0·186
NH_4	0·045	0·001
SiO_2	0·501	Nil.
SiO_2 (clay held in suspension) ...	0·850	0·325

The mean composition of the saline constituents of the coastal sea-water was determined to be as follows:—

Cl	54·510	Ca	1·344
Br	0·200	Mg	3·748
SO_4	7·723	K	1·278
HCO_3	1·017	Na	30 046
NO_3...	0·070	NH_4...	Trace.
SiO_2...	0 030		99·966

Read with the average composition of the saline constituents of rain-water these show that 55 per cent. of the solids in solution in the rainfall are cyclic sea salts, whilst 45 per cent. must have been derived from atmospheric, in part at least cosmic, sources.

The composition of the rain-water solids is not solely dependent on the amount of rainfall—that is, it is not constant and is subject to marked variation. For instance, the content of potassium increased from 2·05 per cent. of the solids in the rain during the first quarter of 1916 to 5·55 in that of the third quarter, but has since steadily fallen, and was only 0·28 per cent. in the rain of the first quarter of 1918. The high potassium content on several samples of the rain-water which had been specially collected in metal and in wooden receptacles was most carefully checked, but always with the same result. Potassium largely in excess of that derivable from cyclic sea salts was a characteristic feature of the rainfall of January to September, 1916.

EXPERIMENTAL WORK.

Reference was made in the last Report to the research which the Committee had in hand relative to the best method of measuring continuously the suspended impurity in the air. A short account of the work done in this connexion is given here.

The general problem of measuring suspended impurity was considered.

The object in view was to find some method of measuring the suspended impurity as distinct from that deposited from the air. The method should permit, if possible, of ascertaining the nature of the suspended matter. Two general methods were considered:—

(1) A method which will permit of measuring and analysing the nature of suspended impurity, or, failing this,

(2) A measurement only in, say, mg. per cubic metre of air.

METHODS AIMING AT WEIGHING AND ANALYSING.

To get an idea of the problem the following is important:—

In experiments made by Mr. Clark for the calibration of the Owens Filter, in London, we found that the amount of suspended impurity varied from about 15 to 30 mg. per 1000 cub. ft.

If we assume—

That errors of weighing will not exceed, plus or minus, 1 mg.;

That the total error permissible in the estimation is 10 per cent.;

this would call for a volume of 667 cub. ft., assuming the presence of 15 mg. per 1000 cub. ft. But as this refers to London and the method is to be applicable to the country also, we might assume that the quantity of air to be dealt with would sometimes be at least three times this amount.

We may then lay down one condition; that is, that the apparatus must be capable of handling the above volume of air, say, 2000 cub. ft.

As the element of time is important, owing to rapid changes in the state of the atmosphere, especially during fogs, we may then proceed to fix a maximum time which would be considered suitable for taking an observation. These two considerations should fix the scale of the apparatus.

POSSIBLE METHODS CONSIDERED.

(1) High tension electric current with electrodes fixed in a light detachable glass vessel, through which air might be passed in a continuous stream through some form of meter. The glass vessel might be removed and weighed and the deposited matter separated for analysis.

Whether this method would be possible or not seems to be a matter for experiment, but as a test of the efficiency of this or any of the following methods the air, after being dealt with, might be passed through the Owens filter to ascertain if there was any deposit.

(2) Some method of precipitation, by fog produced in saturated air, or by a spray of distilled water, or possibly steam. This method alone could hardly be applied to a continuous current of air, as it presupposes a settling chamber, but it might possibly be combined with Method (1).

(3) The air might be filtered through a soluble filter, which by suitable treatment might permit of weighing and analysis.

(4) Filter through filter paper and weigh, then aim at ascertaining only the tarry matter soluble in CS_2 and matter soluble in water, which might possibly be done by simply washing the paper.

(5) A modification of the small standard Owens filter, described in last Report and adapted to give continuous records, might be used.

METHODS AIMING AT WEIGHING ONLY WITHOUT ASCERTAINING THE COMPOSITION.

Owing to the large volume of air to be filtered in order to get a weighable quantity, the only feasible methods for taking observations in a reasonable time appeared to be those dependent upon filtration through a white paper, and comparison of the resulting records by shade.

(1) *The single record Owens filter already described.*—This, while permitting an observation to be taken in about 10 or 15 min., has the following objections: (*a*) It is not automatic nor continuous; (*b*) it does not take account of different coloured deposits.

(2) *Thomson's continuous filter.**—This is operated electrically, taking records on white paper at regular intervals, automatically and continuously. It is questionable whether the seal surrounding the record is sufficiently sound to prevent error due to leakage. The Committee have been unable to obtain one of these filters for experiment, but particulars are given in the *Journal of Chemical Technology*, Vol. II., No. 4.

(3) A simple method might be devised in which air is aspirated automatically through white filter paper by means of water.

With regard to the method of estimating the amount of impurity on a record by its shade, it may be remarked that owing to the fact that the deposit may not be strictly the same colour in all districts, thus introducing some error when observed by reflected light and compared with a scale of shades, it was thought to be worth investigating whether greater accuracy could not be obtained by comparing such records by transmitted light, as the amount of light obstructed by a record should be some function of the amount of deposit.

At the end of the last Report reference was made to an experiment on the effect of obstruction of the filter paper upon the rate of filtration. Particulars of this experiment are given below as bearing upon the subject in hand.

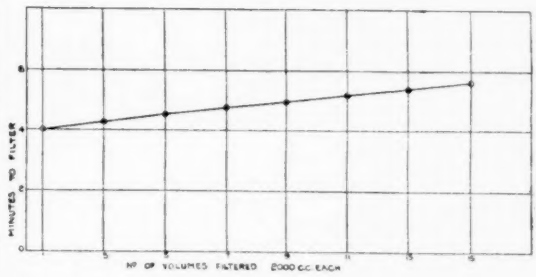
The rate of aspiration through filter paper is altered as the pores become clogged with impurity trapped, and it appeared that this clogging might be made to measure the amount of impurity present in the air. The pores in the filtering disc may be regarded as giving an orifice of a certain area, which is gradually reduced in size as they become clogged by impurity. If then an arrangement be adopted in which there was a constant difference in pressure maintained on each side of the filtering disc, the flow of air through this disc will vary directly as the orifice or area of the pores in the disc, and as the latter are gradually clogged up it would seem that the time required for filtering a given volume should have a direct relationship to the amount of impurity in the air.

If we could obtain a measure of the impurity which does not depend upon the shade of the record, it would obviously be unaffected by the colour of the impurity trapped, and so have the advantage that it would be equally applicable to all places and presumably to all forms of solid impurity.

In view of the above, a series of experiments were made in which the ordinary standard filter was utilised, and 16 different records taken on the same disc, the time required for taking each record being noted as well as the difference in head on each side of the filter paper. The latter was measured by connecting a pressure gauge between the filter paper and the outlet A of the tube (see Fig. 4). In taking each record the time at which the water was started flowing from the upper bottle and the time when 2000 c.cm. had flowed out were noted. The maximum difference of pressure on each side of the filter paper was in every case attained after 10 secs. When 2000 c.cm. had flowed out, aspiration was stopped and the cork removed from the upper bottle so as to admit air; thus the actual volume of air in each case was somewhat less than 2000 c.cm. owing to the reduction in pressure, since the volume was measured under a pull of about 4 ft. of water. But as the conditions were the same in each experiment the effect was merely to reduce the volume aspirated, leaving it the same in each case.

The time required for each record gradually increased from No. 1 to No. 16. No. 1 required 4 mins., whereas No. 16 took 5 mins. 45 secs. The head of water, H on Fig. 4, was 4 ft. 6 in., and the pressure difference on each side of the filter paper varied from 4 ft. in No. 1 run to 4 ft. 1¾ in. in No. 15; thus the pressure difference may be regarded as practically constant. On plotting these results it was found that the relation of time required for aspiration to number of volumes filtered was practically a straight-line one. (See Fig. 3.)

FIG. 3.



The figures obtained are given below:—

Experiment showing Degree of Obstruction of Pores of Filter Paper Resulting from Impurities Trapped from the Air.

No. of volumes.	Volume aspirated.	Head on filter at end of run, inches of water.	Time required to aspirate.
			min. sec.
1	2000 c.cm.	48	4 0
3	,,	48	4 15
5	,,	48¼	4 30
7	,,	48¾	4 40
9	,,	49	4 53
11	,,	49¼	5 10
13	,,	49½	5 20
15	,,	49¾	5 35

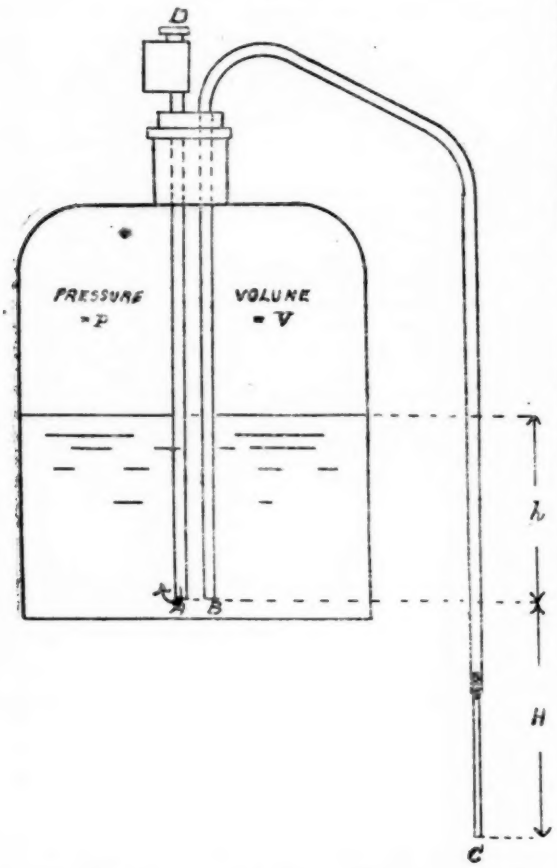
Note.—Each succeeding volume was drawn through the same paper disc. Condition of air as to impurity appeared to be fairly steady during experiment. Head was measured by manometer just behind filter paper. The head of water in outlet tube from bottle was 54 in.

* Designed by Mr. William Thomson, F.R.S. Edin., F.I.C.

INTEGRATING FILTER.

On the suggestion of Mr. F. J. W. Whipple, experiments were made to ascertain if the single record Owens filter could be made to spread its record over a period of, say, 24 hours instead of 10 mins., with a view to obtaining an average for the longer period. Referring to Fig. 4—

FIG. 4.



In the first experiment a filter was fitted up in which the inlet tube reached almost to the bottom of the upper bottle, and the outlet for water reached to about the same level. The rubber outlet tube terminated in a capillary tube of 3 in. long and a bore of 0·02 of an inch. The head was adjusted to give an outflow of water equal to 7·3 c.cm. in 5 minutes. The water dropped in large drops from the end of the tube. This rate gives practically 2000 c.cm. in 24 hours.

To find the effect of surface tension upon the rate of discharge 3 tests were made; in the first the water was allowed to drop in large drops, and the rate of discharge was 7·3 c.cm. in 5 minutes; in the second the water was caused to drop in smaller drops, and the rate of discharge was 7·7 c.cm. in 5 minutes; while in the third the end of the capillary tube was allowed to touch the edge of the measuring vessel, so that no drops formed but a steady trickle took place. This arrangement delivered 9·3 c.cm. in 5 minutes.

The effect of surface tension is, therefore, to retard the outflow when the water is allowed to fall in drops.

A test run of 24 hours was made. The amount of water delivered was 1940 c.cm., and the rate of delivery at the end of the run was exactly the same as at the start—i.e., 7·3 c.cm. in 5 minutes. The temperature was 60° F.

In order to test the effect of temperature on the rate of flow the upper bottle was filled with water at 100° F., and this allowed to trickle through the capillary tube, the head being as before. The water was somewhat cooled in the tube and delivered at about 75° F. The quantity delivered in this case was 8·5 c.cm. in 5 minutes.

Owing to the cooling in the delivery-tube a water-jacket was fitted to the capillary tube and filled with water at 144° F. so as to warm the water at delivery only. This arrangement delivered 10 c.cm. in 5 minutes. The temperature of the water-jacket at the end of the test was 107° F., and the temperature of the water delivered as taken in the measure-glass was 87° F.

A control run was then made without the water-jacket, the water being at a temperature of 60° F.; otherwise all the conditions were the same. The quantity delivered was 7·2 c.cm. in 5 minutes.

Thus it is clear that the temperature has a considerable effect upon the rate of flow of the water by altering its viscosity. In order further to elucidate this another test was made, the conditions being as follows:—

Capillary tube used in outlet, 0·02 of an inch bore, length 4 in., head H 9 in., rate of flow adjusted to give about 7·35 c.cm. in 5 minutes at 60° F. In this case, instead of measuring the amount delivered in five minutes, which was somewhat cumbersome, the temperature of the air was taken at intervals and the time required for the fall of 20 drops from the capillary tube noted. The following table gives the results of this run:—

Time.	Air temperature, ° F.	Seconds per 20 drops.	Quantity delivered.
11 A.M. ...	62·0	65·0	—
12 noon ...	63·0	64·2 to 4·0	—
1 P.M.	62·5	64·2	—
2 P.M.	62·0	65·6	250 c.cm.
5 P.M.	61·0	66·6	510 ,,
6.20 P.M. ...	61·0	66·4	630 ,,
9 P.M.	61·5	66·2	860 ,,
6.30 A.M. ...	52·5	73·6	—
7.20 A.M. ...	52·0	76·0	1725 c.cm.

Taking flow at 7·2 A.M. as = 100.
Flow at 11 A.M. was = 117.

The range of temperature was from 52° to 62° F., and the rate of flow from the capillary tube was 17 per cent. higher at 62° than 52°. The time covered by the test was from 11 A.M. on the 26th to 7.20 A.M. on the 27th, or 19 hours 20 minutes, and the amount of water delivered from the capillary tube was 1725 c.cm., which is equivalent to a flow of 2140 c.cm. in 24 hours.

It should be noted that in these experiments the rate of flow of the *water* was measured; but it does not follow that the aspiration of air through the filter paper was at the same rate, since the

latter is affected also by the expansion or contraction of the air imprisoned in the upper bottle due to the changes of temperature. Expansion of air following a rise of temperature causes a reduced rate of aspiration through the filter paper, since the volume which would normally be aspirated during the rise of temperature is supplied by expansion of the imprisoned air. Thus there may be an automatic compensation for the increased rate of aspiration due to the alteration in the viscosity of the water.

Correction for Change of Water Level in Filter as Affecting Head.

Referring to the figure: When a steady flow from C is established the water level in the tube A D will stand at A and the pressure on the water surface is reduced from atmospheric by the head h. Thus—

if P = atmospheric pressure in feet of water,
p = pressure in bottle " " " "
then p = P − h, or P = p + h.

The head producing flow is H + h + p − P, but since P = p + h this becomes = H, thus the head causing flow is independent of h, and change of level of the water is automatically corrected for.

Effect of Change of Temperature.

This operates in three ways:—

(1) The rate of flow of water from C is altered due to change of viscosity.

(2) The imprisoned air in the bottle has its pressure p or volume V altered.

(3) The density of the air as measured is altered.

Considering (1): The change of viscosity will cause an increase of rate of flow from the tube C of about 3 per cent. per degree C. of rise of temperature.

Considering (2): Suppose the temperature to rise. The pressure p is maintained constant as long as the water level stands at A.

(*a*) If rise is rapid so that volume V increases more rapidly than water flows out, p will rise and the water in A D will rise and aspiration cease. As the water rises in A D the head causing flow increases and a balance may be struck between rate of flow from C under increased head and rate of increase of V.

(*b*) If the rise of temperature is gradual, and such that the rate of increase of volume V due to the rise is less than the rate of flow from C, the water-level will stand at A, but the rate of aspiration will be reduced by an amount equal to the rate of change of volume of V under constant pressure.

For when filter is started the head producing flow of water is H + h and as the water falls gradually in DA the pressure p is gradually reduced until it is diminished by an amount = h, the flow of air increasing as the difference of pressure on each side of the paper increases, while the flow of water from C is reduced. Very soon a steady state is reached when p becomes constant and, assuming no change of temperature, the flow of air through the filter becomes equal to the flow of water from C. This condition continues in the absence of any disturbing factor.

Let Q = volume of air aspirated per min. in this steady state.

Let W = volume of water flowing per min. in this steady state.

Q_1, Q_2 − Q_n = volume of air aspirated during change of temperature in the first, second, and n^{th} minutes.

The condition for steady working is that Q = W.

If the temperature now rises C degrees per min.

Let W increase each minute by an amount = x, owing to change of viscosity of the water.

Let V be increased each minute by an amount = y, owing to expansion.

Assuming a free inflow of air and that pressure of V remains constant, then the condition for continued aspiration is that the rate of flow of water must exceed the rate of increase of volume of V due to expansion.

The flow of water is increased approximately by 3 per cent. per 1° C. rise of temperature; if, therefore, the rise is C. degrees per minute, the flow will be increased per minute by $\frac{3\,WC}{100}$ and after n minutes will be = $W + \frac{3\,n\,WC}{100}$.

Taking normal rate of flow = 1·39 c.cm. per minute and assuming V = 1000, y will be = $\frac{1000\,C}{273} = 3{\cdot}7\,C$.

If the rise is such that 3·7 C. = 1·39, or C = 0·38, aspiration will cease momentarily, but commence again slowly as W increases.

Suppose the rise is greater than 0·38° = say 0·5°, aspiration will stop, and will recommence after n minutes when flow of water becomes = 3·7 C. or when $W + \frac{3\,n\,WC}{100}$ = 3·7 C., when, if C = 0·5, W = 1·39, n = 22 minutes.

The maximum probable rise is about $\frac{1°}{30}$ C. per minute, when y becomes = $\frac{1000}{273 \times 30} = 0{\cdot}124$.

The rate of aspiration after n minutes will be:—

$$W + \frac{3\,n\,W}{30 \times 100} - 0{\cdot}124 = W + \frac{n\,W}{1000} - 0{\cdot}124.$$

Aspiration after 1 min. = 1·267—i.e., slightly reduced.

Aspiration will gradually approach the normal as W increases, and when $\frac{n\,W}{1000} = 0{\cdot}124$ or n = 90 minutes it will become normal and will then commence to exceed the normal after 90 minutes.

Considering what error in total volume aspirated will result after 90 minutes, taking C = $\frac{1}{30}$, V = 1000 (and neglecting change of V due to aspiration).

Since x is the acceleration of W.

Volume of water passed after n minutes
= $W\,n + \frac{1}{2}\,x\,n^2$ (1).

Increase of V = ·124 n (2).

Volume of air aspirated = (1) − (2) = $W\,n + \frac{1}{2}\,x\,n^2 - {\cdot}124\,n$.

And when W = 1·39

Volume aspirated after 90 m. = 119·5 c.c.

The volume which should have been aspirated = 1·39 × 90 = 125 c.cm., therefore error = 5·5 c.cm. in 125.
= 4·4 per cent.

This is an extreme case, and since after 90 m. aspiration would be normal again and the next 90 m. have an error of opposite sign, it seems that the viscosity change will with this condition of the apparatus give a rough compensation for the expansion of imprisoned air.

Referring to the experiments already mentioned Mr. Whipple made the following comment:—

"In the most important experiment you aspirated apparently 860 c.c. from 11 to 9 and 865 c.c. from 9 to 7.20. The 860 c.c. of air if cooled from 62° to 52° would have been reduced in volume to 845 c.c. so that the quantity taken in during the latter period may have been nearly 880 c.c.

The rate from 11 to 9 was 8·6 c.c. (at 62°) per hour
" " " 9 to 7.20 " 8·5 c.c. (at 52°) "

The difference does not seem to me of much importance."

At his suggestion the following experiment was made to try if in actual working the result obtained

by the slow working filter over a long period gave a fair average of the impurity in suspension during that period. Two similar Owens filters were fitted up on Oct. 18th, 1917, at 47, Victoria-street, S.W. One of these was arranged to run very slowly so as to deliver about 2000 c.cm. in 12 hours. This was started at 10.40 A.M. and stopped at 5.30 after 1000 c.cm. had been aspirated through the paper.

The other filter was used to take hourly records using 2000 c.cm., so that eight such records were obtained during the time the slow operating filter was working. Calling the slow filter (A) and the hourly filter (B):—

If the shade numbers obtained by (B) when added and averaged gave a number = the shade of the record got by (A), corrected for volume, the inference would be that (A) gave a satisfactory result. Suppose N_A = shade number obtained by (A) and N_B average shade obtained by (B), then for satisfactory working—

$$N_A \text{ should be } = \frac{N_B \times 1000}{2000}$$

$$\text{or } N_A = \frac{N_B}{2} \qquad \text{or } N_B = 2\,N_A.$$

The actual records from (B) gave a uniform series of shade 4. Thus there was little change in the amount of impurity in the air during the test.

The shade N_A was = 2. Thus N_B was = $2\,N_A$, showing a good result.

The experiment was repeated on October 19th. Seven hourly records were obtained from (B) and one record from (A) running from 11 till 4.25 P.M.

The (B) shades were—6, 6, 6, 4, 4, 4, 4. N_B was therefore, $= \frac{34}{7}$, or 5 as near as possible. N_A was between 2 and 3, taken as 2½, so that again

$$N_B = 2\,N_A.$$

In order to verify the above conclusions the following observations were made:—

The filter was set up and adjusted so as to run at a rate which would cause it to aspirate 2 litres in 24 hours. Instead of counting the drops of water falling from the end of the capillary tube the interval between the bubbles rising in the upper bottle was measured; the temperature of the air at this time was 61° F., the interval between bubbles was 22 seconds, counted from a distance of four or five yards from the filter. There was about 1500 c.cm. of air imprisoned in the upper bottle over the water surface. Dr. Owens, who conducted the experiments, then came close up to the filter and, without touching it, counted the interval again. It had altered to 32 seconds.

He next placed his hand upon the upper bottle for two minutes and then removed it. The result of this was to stop aspiration for a period of 5 min. 50 sec., the water being driven up the tube A D to a height of about 2 in. This observation indicates the importance of the temperature error.

After this investigation it appeared best to try a different form of apparatus. A design for a filter which would operate automatically and give records at short intervals over a period of 12 or 24 hours was therefore worked out and an experimental apparatus constructed by Dr. Owens.

AUTOMATIC FILTER.

In this apparatus an aspirating vessel is provided into which water is admitted through a regulating cock at the bottom. A syphon is fixed inside the vessel, which causes the water-level to oscillate at regular intervals between two fixed levels in the vessel; thus, while the water is rising air is driven out of the vessel, and while it is falling air is aspirated into the vessel.

On the top of the instrument an entrance for air is provided of a fixed diameter, over which revolves a disc of filter paper. Provision is made by which this disc is locked between two plugs, on the lines of the single-record filter, during the time air is being drawn into the vessel. The disc is caused to revolve by a weight and string, but the rate of its revolution is regulated by a stop which follows the hour hand of a small clock placed above the disc. The force for clamping the disc is obtained by a pressure operated flexible diaphragm acting through a lever. The records are given upon a disc of paper upon which the hours have already been marked similarly to a clock-face, and each record is placed automatically opposite the time at which it is taken. Thus the interval between records is unimportant, although, as will be shown below, this is easily adjustable. The present instrument takes a 12-hour disc, but there is no reason why the time should not be longer.

The following is a detailed description of the apparatus, which is illustrated in Fig. 5.

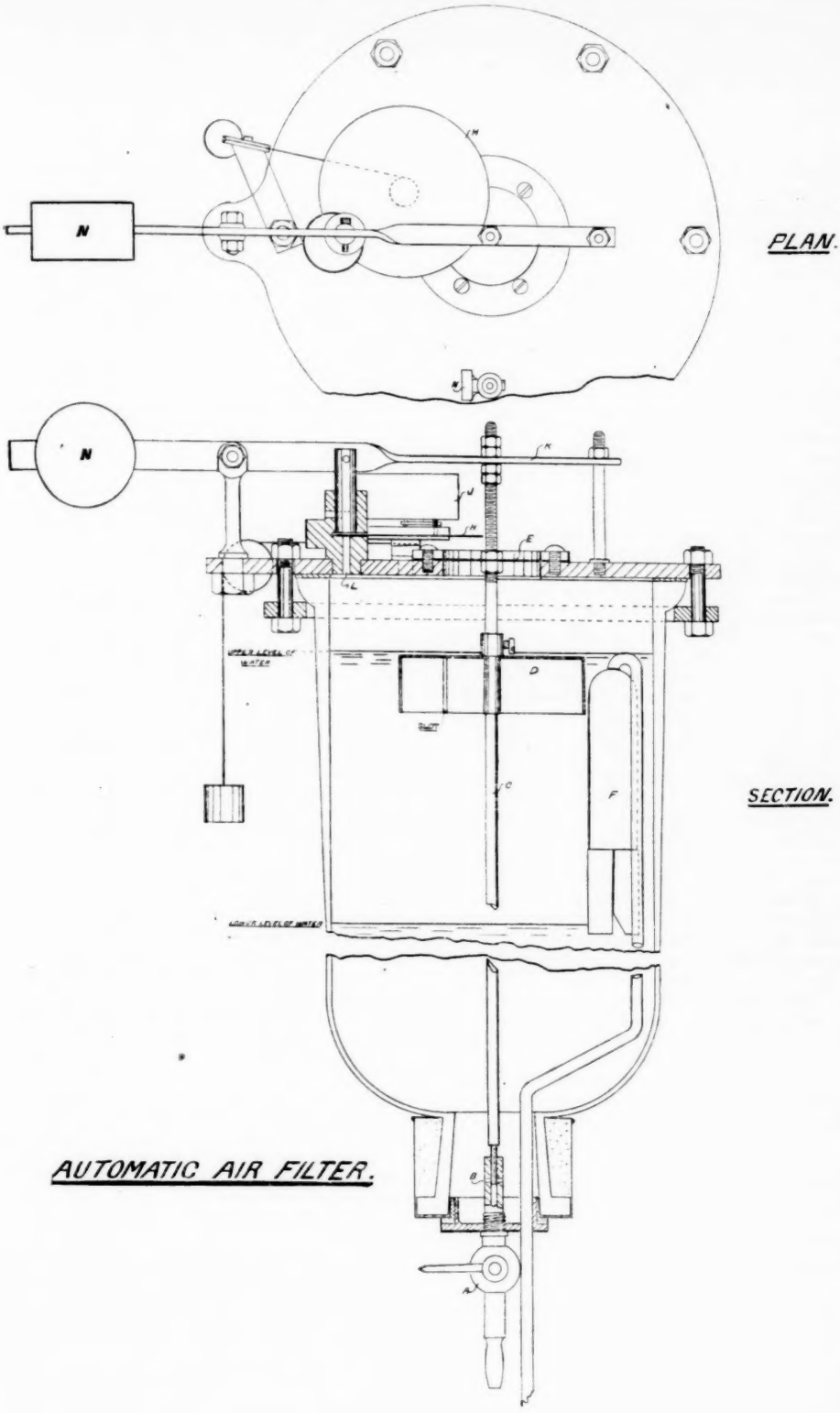
Water-supply.—Water is admitted to the aspirating vessel through a regulating cock, A, at the bottom. This cock is connected with the main, and by adjusting it the interval between records is varied. Fixed inside the vessel and immediately above the regulating cock is a small valve, B, of the piston-valve type. This is operated by a central rod passing vertically upwards through the axis of the main vessel and actuated as described later. The lifting of this rod through a short travel of about 1/8 in. opens the water-supply, and lowering the rod closes it, but not completely, as a small leakage is allowed past this valve for the purpose to be described later.

Air entrance.—The entrance for the air is at L on the diagram; a sleeve is screwed into the top plate of the vessel and contains two plugs, the lower one of which is fixed and the upper capable of a sliding movement sufficient to clamp the filter paper, H, which is placed between the plugs through a slot in the side of the sleeve, in a similar manner to that adopted in the single-record Owens filter. The upper or sliding plug is operated by a lever, K, which is attached to the centre rod, C, the weight of which is balanced by a sliding weight, N. Thus, when the lever is pulled down the upper sliding plug clamps the paper in position over an aperture, the lifting of the lever releases the paper and leaves it free to revolve.

Syphon.—The syphon, F, consists of a long leg communicating with the outer air and a shorter leg of larger diameter inside the vessel, the length of which determines the volume of air aspirated. This shorter wide leg terminates at the bottom in a sliding piece which has a V-shaped notch cut in its lower edge. This sliding piece permits the length of the leg to be adjusted.

It was found that the operation of the syphon was liable to be interfered with in certain ways.

FIG. 5.



AUTOMATIC AIR FILTER.

If the rate of inflow of water to the vessel was very small and the long leg of the syphon was, say, of 5 16 in. diameter, it was possible to get a trickling of water over the bend of the syphon which kept pace exactly with the inflow; thus the syphon would fail to act. To prevent this trickling over, the diameter of the long leg was reduced to about 3 16 in., the object being to force the water to pass over the bend as a solid plug, since the surface tension in the small tube would make it impossible for it to pass otherwise. With a tube of this diameter it was found that the difficulty mentioned was entirely overcome, and the water, if it passed over the bend, went over in a solid plug and the syphon acted.

Another difficulty arose from the fact that the long leg of the syphon when very small in diameter, as has been shown to be necessary, failed to empty itself completely of water, a plug being retained in the lower end which caused an erratic action of the syphon on the next filling, this plug being held up by the capillarity of the tube and the surface tension across the mouth. In order to overcome this difficulty the short leg of the syphon was made of much larger diameter than the long, so that it contained, after the syphon broke, a volume of air several times greater than the long leg, and this air was driven out as the water rose again in the vessel, thus scavenging the long leg and blowing out the plug of water. Again, great care had to be taken that no positive pressure was produced inside the aspirating vessel as the water level rose therein. For example, several times it was found that the syphon acted too soon, owing to the fact that the paper disc was revolving in contact with the mouth of the bottom plug, through which the air had to pass out as the water entered. This was remedied very simply by lifting the disc clear of the mouth. The action of the syphon then is as follows. As the water rises in the main vessel it also rises in the short leg of the syphon until it reaches the bend, when it flows over and the syphon commences to operate. It continues to operate until the water almost reaches the bottom of the short leg, in which, it will be remembered, a V-shaped slot is cut. This V-shaped slot remains inoperative or closed by the surface tension of the liquid until, as the water level falls, the pressure against the surface skin becomes too great for it to resist without rupture: at this moment the skin closing the V breaks and the short leg of the syphon is emptied into the main vessel, air taking the place of water. As the water from the short leg flows out it raises the water in the main vessel slightly, but not enough to cover the V-shaped slot; thus the tube can completely empty itself, which would not be the case if no slot were provided. Immediately the syphon "breaks" the water level in the main vessel begins to rise slowly owing to the slight leakage in the water valve, B, already mentioned, and when the surface has risen a little this valve is opened fully by means to be described, and the water again rises steadily in the main vessel until it again flows over the bend of the syphon, thus completing a cycle.

Filter disc.—The filter disc, H, is about 3 in. in diameter and fixed upon a small turntable opposite the slot in the sleeve, already mentioned. It is caused to revolve by means of a weight and string, but the rate of its revolution is regulated by means of a clock, J. This clock is placed face downwards above the paper disc and the hour hand engages a stop on the disc. The effect of the weight and string is to keep the stop always up against the hour hand when the disc is free to move; when, however, the disc is clamped between the filtering plugs and is not free to move the hour hand of the clock moves away from the stop, to be subsequently overtaken again by the disc when it is released. Thus the interval between two records is made up of (*a*) the period during which the disc is locked and the record being taken, and (*b*) the period during which the disc is free and following the clock-hand round. By setting the clock when the instrument is started the records are marked automatically opposite the time at which they are taken, as shown on the disc; thus whatever the interval between the records may be is comparatively unimportant, since the actual time of taking is shown opposite each record.

Diaphragm.—In the centre of the upper plate covering the main vessel is fixed a flexible diaphragm of leather, E, penetrating the centre of which is the central rod, C. This rod is attached at the upper end to the lever, K, and its lower end forms the water valve, B. This diaphragm serves the double purpose of permitting the movement of the rod when acted on by the bell to be next described, and also it exerts a pull upon the lever, K, when the pressure has fallen inside the main vessel.

Bell.—A bell, D, is fixed on the central rod, C, so that it is just completely immersed at the highest level of the water, when the syphon begins to act. The balance weight is adjusted so that when the bell is empty and not immersed the weight keeps the upper plug lifted clear of the filter paper. The bell is formed as a short cylinder about 3 in. diameter and 1 in. deep, open below and closed above. In the side is cut a narrow vertical slot extending the full depth of the bell and 1 32 in. wide. The effect of the slot is to permit the air inside the bell to escape as the water rises, but when the syphon acts and the water level falls the slot remains closed by the surface tension of the water until the water has fallen sufficiently to rupture the closing film, and until then the bell remains full of water and acts as a weight on the rod, C, pulling it down and giving time for the diaphragm to act. When the water has fallen sufficiently the film closing the slot ruptures and the water falls out, leaving the bell empty and capable of being lifted by the balance weight, N, as soon as the diaphragm ceases to pull on the rod, C.

In this arrangement the surface tension is used as a valve and there are no parts to get out of order or vary in their action. Further, if for any cause the syphon acted too soon the instrument would refuse to take a record since the bell would not operate to pull down the lever, K, unless the slot in its side had been previously immersed to form the closing film.

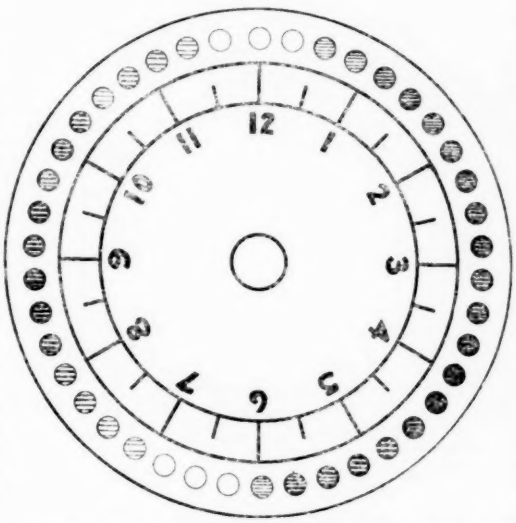
This arrangement was found to work satisfactorily.

Manometer cock.—A small cock, N, is provided in the top of the vessel for the purpose of calibrating. In designing this instrument it was decided to operate with the same volume—i.e., 2 litres—and the same sized filter disc—i.e., 1 8 in.—as in the single-record instrument. In order to fix the volume, attach a manometer to the cock, N, and observe the pressure inside the main vessel. When

the water level in the main vessel begins to fall air is drawn in through the filtering plugs, but not through the filter paper, until the latter is forced down by the action of the diaphragm and bell. The moment that the air commences to pass through the paper is indicated by a fall of pressure inside the main vessel; mark the upper water level when the pressure begins to fall. This level has been found to be perfectly definite and easily observed. To fix the lower level of the water observe the rise of pressure after the syphon breaks; the pressure rises gradually inside the vessel until it becomes atmospheric, and at this moment the level of the water should be marked. The volume of water between these two levels is then measured and adjusted by altering the length of the short leg of the syphon to make this volume equal to 2 litres. The rise of pressure in the vessel after the syphon broke caused the pressure to become equal to atmospheric after the water had risen about 1·4 in. in all experiments made, and this level was always quite definite, so that there appears to be no great room for variation in the volume of air aspirated when once the levels are fixed.

Operation.—The operation of the instrument is as follows: Water enters through the cock, A, and rises in the main vessel. The balance weight keeps the rod, C, lifted, the diaphragm being out of action, and the exit of air through the hole, L, is permitted. The water continues to rise until it flows over the bend of the syphon, immersing and filling the bell, D, when the syphon commences to act. As soon as the syphon acts the water level in the main vessel begins to fall; the bell, D, also falls owing to the weight of its contained water and pulls down the lever K, bringing the upper filter plug in contact with the paper which is pressed down over the air entrance, L. There is thus a resistance to air entering the vessel, the pressure inside falls, and the diaphragm, E, comes into operation exerting a pull upon the lever, K, which forces the sliding plug harder down upon the filter paper, making a joint around the small disc. As the rod, C, is pushed down, the water-supply is cut off by the valve, B, and remains so until the rod is again lifted. Air is now drawn through the filter paper into the vessel until the water reaches the bottom of the syphon, when the syphon breaks and aspiration ceases, the water again commencing to rise and the cycle described above is again repeated.

FIG. 6.



The actual records consist of a uniform film of deposit, the shading in the diagram giving an idea of the variations of intensity.

It was found that some of the earlier records were surrounded by a ring, showing slight leakage beside the filter plug. This indicates that the pressure on the plug was not quite enough, a point of some importance; the head on delivery end of syphon was about 3 ft. To increase the pressure upon the plug we may either increase the length of the long leg of the syphon to, say, 4 ft. or 5 ft., or increase the effective area of the diaphragm.

Using a head of 4 ft. on syphon delivery the pressure of plug on filter paper is about 6 lb., and as the end of plug in contact with paper is an annular ring 1/16 in. wide surrounding the 1/8 in. hole the pressure per square inch is actually about 180 lb. This is not too great, as it is necessary so to compress the paper surrounding the 1/8 in. disc, which is operating as the filter, as to prevent leakage of air.

To obtain this pressure without an inconveniently great head the diaphragm, E, is made to rest on a metal disc of slightly smaller diameter. This converts the diaphragm into what is practically a piston, and greatly increases the effective pressure produced.

The instrument works satisfactorily and with practically no attention. An illustration of the kind of records obtained is shown in Fig. 6.